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The role of shared cultural knowledge in young children's social categorization processes

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1. PREFACE

Humans have a fundamental propensity to divide the social world into groups and think of social relations in terms of categories. In the second half of the 20th century, research in social psychology has provided a vast amount of knowledge on intergroup behavior and attitudes. Motivated largely by the terror of the holocaust, researchers have aimed to gain an understanding of how discrimination, prejudice and stereotyping develop among the population. While some aimed to understand the underlying factors that make certain people more prone to prejudiced thinking than others (Adorno, Frenkel-Brunswick, Levinson & Sanford, 1950; Altemeyer, 1981), others have tried to investigate the seemingly universal proneness of humans to base their social preferences on group membership (e.g. Sherif, Harvey, White, Hood & Sherif, 1961; Tajfel, Billig, Bundy & Flament, 1971; Sidanius & Pratto, 1993; Jost & Banaji, 1994, etc.). While such accounts in social psychology first and foremost target how specific attitudes towards social groups develop, they mostly share an underlying assumption that there is something built deeply into human nature that makes us prone to category-based thinking when it comes to interacting with our conspecifics. Such accounts generally inherently suggest that not only categorization, but category-based prejudice is also inevitable as it can be traced back to basic human needs that make us affiliate with certain people while alienating others. For example, Social Identity theory emphasizes that by making group-comparisons that show the in-group as superior to other groups, we can effectively boost our self-esteem and see ourselves in a positive light (Tajfel & Turner, 1979; see also Self-categorization theory, Turner, Hogg, Oakes, Reicher & Wetherell, 1987). Other theories highlight the role of social categorization in the fight over resources (Sherif, 1966) or stabilizing hierarchical social organizations (Sidanius & Pratto, 1993).

Recently, research in various fields of cognitive science has provided further insight into the cognitive underpinnings of this feature of the human mind (e.g. Sperber & Hirshfeld, 2004; Spelke & Kinzler, 2007; Liberman; Woodward & Kinzler, 2017). There is broad agreement amongst researchers that social categorization constitutes a fundamental and general tendency of the human cognitive system, however the role and exact underlying mechanisms of this function are still debated. Importantly, most accounts tend to differ from those described in the social psychology literature in that they take a more neutral approach to the basic phenomenon of categorization and shift the focus away from attitudes or even go as far as to claim that prejudice is not an inevitable

consequence of categorization (Liberman et al., 2017). Theories tend to emphasize the innateness of this capacity and the explanations often take an evolutionary perspective (e.g. Sperber & Hirschfeld, 2004; Gil-White, 2001; Cosmides, Tooby & Kurzban, 2003). Based on the idea that social categorization is a fundamental function of the human mind, the past years have brought a large expansion of studies in developmental psychology targeting young children or even infants' tendencies to cluster the social world. These studies may help us understand the core nature of such processes by investigating them in children who have had limited opportunity to endorse the existing prejudices or stereotypes of adults. In this dissertation, I will try to highlight some features of children's social categorization processes and propose a possible way to account for humans' strong tendency to sort the social world into groups.

The theoretical framework of the dissertation adopts an evolutionary perspective and accepts the premise that – at least to some extent – the cognitive system has evolved faculties in response to selection pressures in the environment. Rationale for such presumptions will only be presented inasmuch it explains why researchers treat social categorization as one of these domains, but I will not present the argument regarding the validity of the evolutionary perspective in psychology.

2. INTRODUCTION

2.1. The cognitive foundations of social categorization

Understanding the cognitive foundations of social categorization or trying to give any account of it has to be traced back to a more general debate on the basic structure and mechanisms of the human cognitive system (Spelke & Kinzler, 2007). One possible way to conceptualize the human mind is to think of it as a general learning device that can flexibly acquire information about a large diversity of phenomena and that deals with different areas of life much the same way (e.g. McClelland & Rumelhart, 1985; Kirkham, Slemmer & Johnson, 2002). Another competing view suggests that the importance of such domain-general learning mechanism in development are overshadowed by the existence of highly specialized modules that guide learning and development in a domain-specific way (e.g. Fodor, 1985, Cosmides & Tooby, 1994; Spelke, 2000). Such modules are supposedly evolutionary adaptions that have developed to help humans efficiently form and enrich representations about areas of life that had special relevance for our ancestors (Cosmides & Tooby, 1987). Modularist theories also come in different forms: some argue for a radical view, suggesting that the human cognitive architecture can be broken down into a large number of specialized modules (e.g. Sperber, 1994; Carruthers, 2005), while others claim that there are only a limited number of innate domain-specific cognitive devices that have evolved to deal with those questions that are of special relevance to humans (e.g. Spelke, 2000).

Irrespective of how radical a view we adopt, there has been a wide consensus regarding the notion that one key area the human mind needs to be prepared to process information about is the social world. Given humans' "ultra-sociality" (Boyd & Richerson, 1998), we must be able to successfully navigate not only the physical, but the social world as well. One fundamental aspect of this is conducting successful interpersonal interactions, which is largely dependent on our ability to reason about the mental states of others ("theory of mind", Premack & Woodruff, 1978). A growing body of evidence supports the notion that this capacity is present from a very early age in humans, suggesting that the cognitive faculty for mentalizing has innate roots (Onishi & Baillargeon, 2005; Southgate, Senju & Csibra, 2007; Buttelmann, Carpenter & Tomasello, 2009; Kovács, Téglás & Endress, 2010, etc.). However, human sociality goes

beyond interactions with single individuals. Arguably, substantial and significant evolutionary changes in the cognitive system were associated with changes in the structure of group-living (e.g. Hermann, Call, Hernandez-Lloreda, Hare & Tomasello, 2007). Thus, it has been proposed that reasoning about the wider social niche (leading to representing social categories) is also realized with the help of a specially evolved cognitive module (e.g. Hirshfeld, 1995; Spelke & Kinzler, 2007; Sperber & Hirschfeld, 2004). This module operates from early infancy and its existence can be attributed to human's unique sociality that presented a challenge for successfully navigating a complex social world.

2.1.1. Essentialist reasoning about social kinds

Since group living constitutes such a fundamental element of human nature, it is reasonable to assume that the human mind has developed special faculties not only to reason about physical entities or the behavior of individuals, but also of the dynamics of social groups (Spelke & Kinzler, 2007, Sperber & Hirschfeld, 2004). Naturally, one of the most fundamental things one needs to be able to comprehend is how social groups are organized – where are the boundaries of different social categories. With the help of such a capacity, humans can gather representations of social categories to make inductive inferences about other people and predict their behavior, similarly to how they use category representations of artifacts and other natural kinds (e.g. Rothbart & Taylor, 1992; Bar-Tal, 1996; Hirshfeld, 1995; Diesendruck & Eldror, 2011).The inductive power of social categories is related to humans' tendency to essentialize certain categories (Medin & Ortony, 1989), that is, to hold the belief that categories have underlying "essences" that define them and have a causal role in shaping other characteristics of the category members. This essentialist stance to categories in general warrants rich inferences to non-obvious features of individuals in possession of a single piece of information about category membership. Essential features are innate, stable and in most cases unobservable and elusive to define. This notion can be most easily applied to natural kinds, such as animals and plants (e.g. the essence of "catness" makes a living creature have four legs, eat meat, be helpful in keeping away rodents from the house, etc.) and evidence suggests that humans – even in childhood – tend to apply essentialist

notions to animals more than to artifacts (Gelman & Markman, 1986; Gelman, 1988; Diesendruck & Gelman, 1999).

Lately, it has been suggested that humans also tend to essentialize certain social categories, leading them to draw strong inferences about people based solely on group membership (Hirschfeld, 1996; Gil-White, 2001; Diesendruck & Eldror, 2011). However, the scope of such an essentialist view of human nature is not universal, either across different types of classification of people or across human cultures. While some categories are generally more easily essentialised (e.g. sex), there is considerable cultural variation in how much inductive power is assigned to others, such as ethnicity (Diesendruck, Goldfein-Elbaz, Rhodes, Gelman & Neumark, 2013). Moreover, Rhodes, Leslie and Tworek (2012) have demonstrated that communication plays an important role in the transmission of essentialist beliefs about social categories. These results point out that while the human brain is possibly pre-wired to process information about the social world in a specific way, adults' and older children's representations are formed by a strong interaction between cultural input and innate tendencies.

2.1.2. Studying young children's social categorization processes to unravel the underlying mechanisms

Considering the enormous effect of socialization on how humans represent and reason about social groups, studies with young children provide a better opportunity for investigating the innate features of social categorization, or – in Hirschfeld's (1995) terms – the naïve sociology module. Such studies may not only provide evidence of a possibly innate module, but our understanding of the basics of social categorization may be further expanded by exploring the cues of social groups that even infants are sensitive to. As Sperber and Hirshfeld (2004) suggest, each module developed to deal with certain stimuli in the environment that are important and salient for our species. This is termed the „proper domain" of the module. Thus, the module will monitor the environment for stimuli that fall within the scope of the proper domain and if certain conditions are met, the stimulus activates the module. Those stimuli that meet the conditions to activate the proper domain of a module constitute the „actual domain" of the module. The actual domain will constitute of stimuli that had been most relevant for the module in a given environment. Evidently, the actual and the proper domain of the module will never

concur perfectly; however, as a result of evolutionary processes, the conditions for activation should be set in a way that provides optimal hit ratios.

One way to investigate the nature and function of a given faculty of the human mind is to gain information about the actual domain of the module, in other words: to explore the simuli in the environment the module responds to. Applying this idea to the question of social categorization: unraveling those cues of group membership that even young children seem to be sensitive to can inform us about the adapted function of social categorization.

Traditionally, three dimensions of social categories have been proposed to have a special significance in humans' representations: age, sex and race. It has been suggested that they occupy a prominent role even in the representations of adults (Fiske, 2000), despite their tendency to make any minimal group distinctions (Tajfel et al., 1971). These cues have been of special interest for researchers investigating young children's categorization processes as well and a special emphasis has traditionally been put on racial categorization, based on the unsettling findings that negative attitudes toward racial out-group members seem to occur before children reach school age (Clark & Clark, 1939; Hirschfeld, 1995; 1998; 2008).

One of the earliest results regarding young children's reasoning of social categories and manifestation of category-related prejudice can be traced back to the 1930's, when Clark and Clark (1939) reported that pre-school aged African-American children showed a preference for dolls and drawings of dolls that represented the racial group of the majority of the given society (Caucasian) over ones that represented their own race. Such results suggest the gloomy notion that racial prejudice develops very early in development and seem to resemble the stereotypes of adults. Moreover, this also points to the conclusion that the human mind is particularly prone to use race as a cue along which to divide the social world into groups. This idea has gained further support in numerous studies during the following decades (e.g Taylor, 1966; Bigler & Liben, 1993; Hirschfeld, 1995; Katz & Kofkin, 1997).

Recently, the view that race is a fundamental dimension of social categorization has been challenged by showing that 1, there is a fourth cue to group membership (language), that seems to occupy a prominent role in children's representations (Kinzler, Dupoux & Spelke, 2007) and 2, race may lose its significance if contrasted with other

cues of group membership (e.g. Kinzler, Shutts, DeJesus & Spelke, 2009; Kurzban, Tooby & Cosmides, 2001). The next section gives a short overview of infant and child studies exploring the role of the four group distinctions that have received special attention in the literature.

2.1.3. Dimensions of social categorization

2.1.3.1. Sex

It has been a highly consensual notion in developmental psychology that gender is an early emerging concept in the human mind and that children from a very young age are able to detect sex differences and make gender-based inferences. Research has had a strong emphasis on the role socialization plays in shaping one's sexual identity and how humans come to conform to gender-stereotypes. It has been demonstrated, for example, that children start to understand gender-labels in their third year of life and that labeling skills predict gender-typed behavior (Fagot & Leinbach, 1989). Moreover, already toddlers possess a vast knowledge of gender-typed artifacts and activities (for a review see Martin, Ruble & Szkrybalo, 2002).

Research has shown that the sensitivity to differences in sex emerges in infancy. In a habituation paradigm, Miller (1983) presented infants with male or female voices and found that 6-month-olds dishabituated to recordings of opposite-sex voices, but not to ones belonging to the same sex they had been habituated to. In a similar paradigm using male and female faces instead of voices, Leinbach and Fagot (1993) found that 9- and 12-month-olds dishabituated to photographs of faces that did not match the sex presented at habituation.

Infants already at 6 months of age are also able to form intermodal representations of gender (Poulin-Dubois, Serbin, Kenyon & Derbyshire, 1994). In the paradigm of Poulin-Dubois and colleagues (1994), infants heard the voice of a male or a female person while they were presented with pictures of a male and a female face simultaneously on a monitor. Results show that for female stimuli, 9-month-olds fixated more at the congruent face, indicating their ability to associate the visual and the auditory stimuli. Interestingly, for male models, such a result was only obtained for 12 month-olds. Walker-Andrews, Bahrick, Raglioni and Diaz (1991) used a similar paradigm, however,

instead of still photographs they presented infants with video recordings. In this case, even 6-month-old children were able to associate voice with visual stimulus.

The diverse developmental trajectories for male and female stimuli (Poulin-Dubois et al., 1994) may be accounted for by a spontaneous preference for females. Quinn, Yahr, Kuhn, Slater and Pascalis (2002) tested infants in a familiarization paradigm, where 3- and 4-month-old children were presented with male or female faces in the familiarization phase. In the test phase, infants looked longer at female faces if they were familiarized with male faces, but they showed no such increase in looking times in the opposite case (male faces after a series of female faces). However, results were reversed if the primary caregiver of the child was a male. These results suggest that gender preferences do not develop as part of a general tendency to favor in-group members, but as a result of infants' bias toward their primary caregiver.

However, the simple fact that they show preferences for either of the sexes implies the ability to encode the category of sex as early as 3 months of age.

2.1.3.2. Age

Similarly to gender, the earliest traces of categorization on the basis of age can be found in the first months of life. Using the same intermodal matching looking-time method as in the study on gender (Walker-Andrews et al., 1991), Bahrick, Netto and Hernandez-Reif (1998) tested whether 4- and 7-month-old children could match the voice of an adult or a child speaker to the corresponding face (based on age). They presented children with a display depicting a child and an adult next to each other, while either the voice of the adult or the child was presented. Results show that infants already at 4 months of age looked longer at the appropriate face (e.g. at the child when a child's voice was heard).

Going beyond visual preferences, Shutts, Banaji and Spelke (2010) tested whether there are any differences in how 3-year old children endorse the preferences of others, depending on the target's age. In their experiment, a peer and an adult expressed positive attitude towards different novel objects. After the demonstration, both models appeared on the screen next to each other together with the objects. Participants were asked to choose between the two objects presented. Results show that 3-year-olds were more

likely to endorse the object toward which the child model had expressed positive attitudes.

The majority of evidence on children's ability to discriminate between adults and children come from studies on social learning and imitation, in particular. Interestingly, existing literature diverges on the question of whether children are more receptive to knowledge presented by an adult or a peer. In one line of research, scientists argue that the age of the model affects social learning through the perceived reliability or competence of the model, therefore adults are more likely to be imitated (Henrich & Gil-White, 2001; Zmyj, Daum, Prinz, Nielsen & Ascherleben, 2011; Rakoczy, Hamann, Warneken & Tomasello, 2010; Elekes & Király, 2012). However, other results depict a more complex picture. Ryalls, Gul and Ryalls (2000), for example, found that 14-to 18-month old infants were more likely to copy the behavior of children that were a little older than themselves than that of adults. Similarly, Seehagen and Herbert (2011) showed that 24-month-olds were more willing to imitate other children than adults after a 10-minute delay, though no such results were obtained during immediate imitation. Moreover, the reversed pattern of results was obtained in the case of 15 month-old infants. Zmyj, Aschersleben, Prinz and Daum (2012) provided a more elaborated picture on the question by showing that 14-month-old infants prefer adults as the source of information when learning about novel objects, but peers are favored when the information presented concerns familiar objects. Similar differential preferences were found in the study of VanderBorght and Jaswal (2009) where 3 to 5 year-old children reported that they would address questions regarding toys to children, but would seek information about food from adults.

These findings support the notion that age is an important information about fellow individuals that is encoded from early on and effectively guides behavior. Another interesting conclusion to draw from these results is that preferences alter flexibly in accordance with the context.

2.1.3.3. Race

The investigation of racial thinking and stereotypes has always been at the heart of research on social categorization, undoubtedly due to its relevance and salience in social issues in modern societies. Many researchers claim that next to age and gender, race is one of the fundamental dimensions of social categorization (Brewer, 1988; Fiske, 2000).

The significance of race has been supported by empirical evidence showing that race encoding already occurs in early childhood. Researchers have demonstrated that 5-6-year-old children understand social categories based on race and that they are prone to entertain racial stereotypes (Hirschfeld, 1995; Dunham, Baron & Banaji, 2008; Baron & Banaji, 2006). While some scientists argue that evidence of race encoding found at this age reflects the fundamental nature of this tendency (Baron & Banaji, 2006; Dunham et al., 2008) others emphasize that learned effects in racial categorization are apparent as early as 9 months of age (e.g. Kelly, Quinn, Slater, Lee, Ge & Pascalis, 2007). Therefore, evidence from studies with preschool-aged children cannot disentangle the roles of social learning and possible innate tendencies.

Evidence from infant studies support the claim that race is automatically encoded from early on more convincingly. For example, Kelly, Quinn, Slater, Lee, Gibson and colleagues (2005) found that Caucasian 3-month-old infants (but not newborns) prefer to look at Caucasian faces compared to other-ethnicity faces. In a similar, but more elaborated paradigm, Bar-Haim, Ziv, Lamy and Hodes (2006) demonstrated that this effect disappears when the infants are raised in a social environment that is mostly made up of individuals of a different ethnicity. Thus, the social environment and learned regularities in them play a significant role in infants' preference for same-race individuals.

In a different paradigm, Kelly et al. (2007) provided support for this claim by studying the emergence of the so-called "other-race effect" (Meissner & Brigham, 2001) between 3 and 9 months of age. The other-race effect refers to the relative difficulty of distinguishing between two faces of a different race compared to two faces belonging to the participant's own race. In this study, using a habituation paradigm, the authors found that while 3-month-old infants were equally good at distinguishing between other-race and same-race faces, 9-month-old infants already exhibit the other-race effect.

Also building on the other-race bias, Shutts and Kinzler (2007) found that among 2.5- to 5-year-old, memory for black and white morphed faces were better when they were presented together with the white face that it was composed from rather than when they were presented with the black contributor. These results similarly suggest an increased difficulty of differentiating between people based on facial features when the target's race does not match the participant's race.

Although these results imply that race encoding emerges very early during development, they also point out the importance of learning processes about the social environment. Lately, the claim that race is a fundamental dimension of categorization has been challenged by studies showing that the perceived relevance of racial categories is significantly diminished by other distinctions. For example, when presented with pictures of children where race and spoken language provided opposing indication of group membership, 5-year-old children's preferences (choices of friends) were guided by linguistic cues and not race (Kinzler et al., 2009). Similarly, Kinzler and Spelke (2011) failed to show a clear preference for same-race individuals with the toy taking and giving paradigm (Kinzler et al., 2007) in younger children (below the age of 5). Moreover, Krieger, Möller, Zmyj and Aschersleben (2016) have shown that 4-year-old children are not more likely to imitate racial in-group than out-group members.

2.1.3.4. Language

More recently, another factor has been identified as a reliable basis for social categorization for young children: language. In one of the first studies, Kinzler and colleagues (2007) investigated the social preferences of 6 – and 10-month-old infants and 5-year-old children based on linguistic cues. Children were presented with two models, one of whom spoke in the child's native language and one who spoke in a different language. In a subsequent phase, social preferences were tested using different (age-appropriate) measures. The authors found that 6-month-old infants preferred to look at the protagonist that had previously spoken in their native language. Similarly, 10-month-old infants accepted an offered toy more willingly from a native speaker than from a foreign language speaker, while 5-year-old children made explicit friendship choices based on the previously provided language cues (again, favoring the native speaker).

In the past years, a growing body research has found support for the claim that linguistic cues (language and accent) effectively guide children's social preferences (both visual preferences and preference for interaction) and some researchers claim that these preferences have common roots with early social categorization processes. For example, Kinzler, Dupoux and Spelke (2012) have shown that infants and young children prefer to interact with toys that were introduced by a native speaker over one introduced by a person speaking in a foreign language. Moreover, when given a chance to hand an object

to one of the two models, young children chose to give to the native speaker. In other studies, selective trust in native accented speakers have been demonstrated in different domains, such as food-choices (Shutts, Kinzler, McKee & Spelke, 2009) or object functions (Kinzler, Corriveau & Harris, 2011). Evidence suggests that language cues not only guide children's social preferences, but serve as an indication of social relations. Liberman, Woodward and Kinzler (2016) have shown that 9-month-old infants find it more likely that two speakers of the same language would affiliate with each other than speakers of different languages. Similarly, 14-month-olds expect the food preferences of people to be generalizable to linguistic in-group members, but not to out-group members (Liberman, Woodward, Sullivan & Kinzler, 2016).

A cross-cultural study confirms that language-driven social preferences exist in non-western cultural settings as well, thereby suggesting that it may be a human universal (Kinzler, Shutts & Spelke, 2012). The robustness of the phenomenon is also supported by the fact that 5-year-old children view language proficiency as a more stable trait than race (Kinzler & Dautel, 2012). This difference in the relative importance of different factors guiding social preferences have been confirmed by other studies as well, finding that the importance of race is diminished in the presence of linguistic cues (Kinzler et al., 2009).

2.1.4. Summary of the developmental results

The above described results point out that social categorization emerges early in childhood and that children's social preferences and categorization processes in many ways resemble those of adults, suggesting continuity in this domain of social cognition (Kinzler, Shutts & Corell, 2010). However, recent results in developmental and evolutionary psychology point out important differences. Namely, although infants and young children seem to perceive and respond to visually salient distinctions, such as sex, age and race (or even shirt colour, see Bigler, Jones & Lobliner, 1997), race may not be as robust a category-distinction as previously described. This is indicated by the results that other social preferences emerge earlier in development (Kinzler & Spelke, 2011) and that race loses its significance in the face of other cues of group membership, such as accent (Kinzler et al., 2009).

From the evolutionary point of view, this suggests that race may not have been part of the actual domain of the naïve sociology module, thus the module was originally designed to process information for which race was not a relevant cue. Since the role of race perception and race-based attitudes have been a central part of the discussion on the original function of the human mind's tendency to sort the social world into categories, these findings can put a new perspective on our views of this function.

2.1.5. The cognitive function of social categorization

Without much controversy, the fundamental function of social categorization must parallel the function of categorization in all other domains: namely, to cluster individual entities into sufficiently homogeneous groups, allowing us to make inferences about a particular member of the group based on knowledge stored about the category itself. Category representations fulfill their purpose if the inferences derived from category membership help guide behavior in an appropriate manner. In the domain of artifacts, for example, representing the category "light switch" will allow us to recognize light switches in rooms we have never been before and to successfully operate them in order to create light. Recognition is fostered by observing the perceptual features of the object, but the correct inferences about the effects of pushing the newly encountered object is dependent on having represented the function of the object as the core feature of the category.

In the social domain, representations of social categories fulfill their purpose if they allow inferences that will help conduct successful interactions with fellow humans. However, given the complexity of the social world, those features or clusterings that will be the most useful in this respect are far from obvious. Arguably, a module designed to specifically reason about social groups cannot be rigid as social clusterings may happen in an endless number of ways and the relevance of each kind of clustering will be determined by the context. This notion is in line with general observations and empirical results that social category representations are highly flexible and adapt to the context easily (e.g. Turner, Oakes, Haslam & McGarty, 1994).

Another important difference between categorizing objects and people is that the latter inevitable brings with itself placing ourselves in the category structure

superimposed on society (Bodenhausen, Kang & Peery, 2012). Thus, social categorization inherently has a self-relevant aspect (see Self-categorization theory, Turner et al., 1987). For this reason, group affiliations and category-related attitudes have always been in the center of interest in the social psychology literature, both in terms of how a motivation to affiliate modulates these processes (Tajfel et al., 1978) and how it relates to representations of the self (e.g. Turner et al., 1987). Affiliative accounts of social categorization tend to emphasize the need to belong and the motivation to enhance our self-esteem through positive evaluations of the group we belong to.

Although affiliative and cognitive (epistemic) accounts of social categorization are rarely integrated, the growing body of research on infants' and young children's social categorization processes call for a perspective that can account for at least the following two facts: 1. Group-based social preferences can be demonstrated at an age when the self-concept is weak or even non-existent; 2. There is considerable difference in the relative importance young children assign to different cues of group membership. Importantly, infants will not interact differentially with people based on skin-color, even in the absence of other cues of group membership[1] – contrasting with the results of the minimal group paradigm with adults (Tajfel et al.,1971) that provided the empirical ground for Social Identity Theory (Tajfel & Turner, 1979; Hogg & Abrams, 1988) and Self Categorization Theory (Turner et al.,1987).

Thus, the question arises: what is the fundamental function of social categorization and importantly, what kind of epistemic functions does it serve (next to the affiliative ones)? From an evolutionary perspective: what are the inferences we were "originally" supposed to make based on group membership that helped our ancestors successfully navigate the social world and what are the ones that can be considered runaway phenomena leading to unjustified stereotypes?

Before introducing any specific ideas, it has to be clarified that there may not exist a unifying account of the function of social categorization that would provide sufficient explanation for all domains. That is, it is reasonable to assume that the selection pressures that lead to our ability to distinguish between the sexes (traditionally viewed as a primary dimension of social categorization) have not much to do with the factors that contributed

1Minimal group affiliations seem to emerge around 5 years of age (Dunham, Baron & Carey, 2011).

to the development of a faculty designed to reason about racial or linguistic differences. While the former has a clear – and universal – biological relevance for procreation; the latter two may gain relevance at the cultural level. However, the two may come into interaction with each other, as the existence of gender-related stereotypes (e.g. Poulin-Dubois et al., 1994; Eichstedt, Serbin, Poulin-Dubois & Sen, 2002) suggest that perceiving sex differences may lead the cognitive system to view it as an appropriate input for inferential processes related to reasoning about social categories in general (i.e. encoding the category "sex" may lay the ground for the development of gender stereotypes that do not follow from the biological distinction).

2.1.5.1. Kin recognition

A fundamental differentiation between consepcifics involves the ability to determine kinship relations. Perceiving another individual as being related to oneself guides social behavior in a wide range of interactions and importantly, not only in humans, but animals as well. It has been proposed that the genetic success of an organism can be determined by the survival of its genes (inclusive fitness); therefore the individual will be motivated to promote the success of other individuals that share a part of their DNA – thus, most likely, kins (Kin Selection Theory, Hamilton, 1964). Accordingly, individuals exhibit more altruistic behavior toward kins (Burnstein, Crandall & Kitayama, 1994; Lieberman, Tooby & Cosmides, 2007) and more aggression towards non-kins (Daly & Wilson, 1988) showing that the ability to differentiate between kins and non-kins is crucial in guiding social behavior.

A wide range of species have been shown to be able to recognize kins (for a review, see Blaustein. Bekoff & Daniels, 1987) and lately, Lieberman, Oum and Kurzban (2008) have provided evidence that humans also have a fundamental tendency to differentiate between others based on kinship. One proposed mechanism behind this ability is the so-called phenotypic matching: inferring genetic similarity from phenotypic similarity based on experience. That is, the individual learns about the phenotypic characteristics of itself and relatives and the genetic proximity of a previously unknown individual will be inferred based on how close their phenotype is to that of the relatives (Blaustein, 1983). Phenotype matching thus requires the selection of characters that

correspond to allele variations that 1, exhibits constancy among relatives; 2, shows variation between families.

Another possible mechanism for kin recognition is based on familiarity in a more general sense: since the primary environment of an individual is more likely to be comprised of relatives, familiarity can provide a cue for whether another individual is likely to share DNA with oneself (Bekoff, 1981).

However, Grafen (1990) has argued that the pervasive ability of kin recognition across animal taxa may not be kin recognition in its true sense, but merely a side effect of mechanisms that allows animals to recognize conspecifics or members of their own group (since both show some correlations with genetic background). Species recognition is of crucial importance for mating, while recognizing individuals belonging to the same social group (not just kins) can be important for all social species. Empirical evidence supports the claim that at least certain primates can recognize group members and prefer in-groups over out-groups (macaques: Mahajan, Martinez, Gutierrez, Diesendruck, Banaji & Santos, 2011).

Thus, the role of kinship in social categorization, especially in the case of humans may be limited. As shown by Lieberman and colleagues (2008), humans possess a strong tendency to categorize based on kinship, however, given that one of the most important characteristics of human group living is the cooperation of individuals unrelated to each other, kin recognition cannot account for human social categorization in general – or would not provide sufficient help in navigating a much more complex social environment. This also calls into question the idea that the perception of perceptual differences play a key role in human social categorization: phenotypic matching can only be seen as a key mechanism if the main goal is to identify genetically similar individuals.

2.1.5.2. The coalition detection hypothesis

A theory put forth by Kurzban, Tooby and Cosmides (2001) proposes that categorizing between fellow humans is related to the evolved cognitive machinery that is designed to detect coalitions and alliances in the environment. The authors claim that while certain category distinctions, such as race, could not have been relevant for our hunter-gatherer ancestors – given that there was no long-distance travelling that could

have brought together people of different ethnicities (Kelly, 1995) –, coalitions were regularly formed both for negotiating conflict with neighboring groups and for transient purposes within societies (Kurzban et al., 2001, Cosmides et al., 2003). A "coalition detection system" has thus been evolved in order to track the alliances formed between people. The challenge this cognitive machinery faces is that cues to coalition affiliations are not absolute, often not easy to observe and only evidenced by behavior exhibited in social interactions, making it more difficult to make ex-ante predictions. Thus, beside sensors specifically developed for decoding coalition cues, the system also makes use of correlations between behavior and appearance, and may use appearance cues as a proxy for coalitions.

The theory's validity has been supported by a number of studies showing that categorization by race can be significantly reduced or even suppressed by giving conflicting information about the group allegiances of people (Kurzban et al., 2001, Pietraszewski, Cosmides & Tooby, 2014, Pietraszewski, Curry, Peterson, Cosmides & Tooby, 2015).

2.1.5.3. Social categories as markers of social obligations

Based on findings in developmental psychology, Rhodes and Chalik (2013) have proposed that one of the most important roles social category representations play in making predictions about human behavior is that it allows us to infer social obligations. That is, (already) children have the expectations that people belonging to the same social group are supposed to support and protect each other and that people will act in accordance with this obligation. The authors argue that the idea of people having such an intuitive theory of how people are expected to relate to one another can better explain results showing that social category membership seems to warrant only a limited range of inferences about people for children (e.g. children do not expect people belonging to the same race to share psychological properties, e.g. Rhodes, 2012; Shutts, Pemberton Roben & Spelke, 2013). An intuitive theory specialized to track social obligations will not make predictions beyond the ones that concern how people will relate to each other, thus – the authors claim – such an account fits better with empirical evidence.

2.2 Shared cultural knowledge

It is a widely held notion among anthropologists that the main differences between human groups are cultural, rather than biological or technological (e.g. Boas, 1984; Henrich & Boyd, 1998). This means that human groups are characterized by shared norms, ideas and knowledge that govern the behavior of group members and regulate interpersonal interactions. Exploiting all the advantages group living provides humans with, one must possess knowledge of these shared ideas and importantly, must adhere to the social norms established in the given group, otherwise the individual risks overthrowing the system that the group members depend on and consequently risks evoking the retaliation of other group members (e.g. Boyd & Richerson, 1992; Fehr & Gachter, 2002; Fehr & Fischbacher, 2004). For example, traffic rules are established in order for people to get around in cars safely, and both ignorance and deliberate breaking of the rules can result in serious consequences for the non-cooperating individual and other group members as wells. Moreover, similar behavior from a larger group of people will result in the collapse of the system; therefore group-members are motivated to keep to the norms and enforce them on other others as well. The role of shared norms in holding groups together is supported by findings in developmental psychology about young children's strong propensity to enforce norms on others (Rakoczy & Schmidt, 2013). Moreover, already at 3 years of age, children show an understanding of the cultural nature of norms as shown by the fact that they protest more when a convention violation is committed by an in-group member as opposed to an out-group member (Schmidt, Rakoczy & Tomasello, 2012). Similarly, adults are less tolerant toward in-group than out-group norm-violators (Shinada, Yamagishi & Ohmura, 2004).

One of the most marked features of human group living is the large-scale cooperation of group members that is realized with the help of such social institutions. This form of group living makes it possible for humans to build cultures that are unprecedented in any other animal species and possibly allows for the uniquely developed cognitive system of humans (Hermann et al., 2007). Thus, sharing knowledge and ideas constitute a fundamental element of human group living.

All of this, however, relies on one core capacity: the ability to transmit information from one generation to the other (and also within generation). Many researchers define culture as a set of knowledge that is transmitted via social learning,

resulting in stabilized variations between groups (Boyd & Richerson, 1996; Henrich & McElreath, 2003). Without this, cultural practices and knowledge would be transient and would only exist in the service of short-term goals. It would also be limited in the scope of individuals that may have access to it.

Human social learning mechanisms allow for the emergence of the so-called „cumulative cultural evolution" (Cavalli-Sforza & Feldman, 1981; Boyd & Richerson, 1996), making it possible for humans to come up with inventions on the bases of knowledge accumulated by the previous generations that no-one could have come up with in the absence of the contribution of the predecessors. This kind of cultural evolution leads to variation between groups that cannot be accounted for by genetic or environmental factors (Boyd & Richerson, 2005).

2.2.1. The role of cultural transmission in the preservation and stabilization of human societies

It has been argued that such cultural evolution is dependent on the interaction of two types of learning mechanisms: individual and social learning (e.g. Boyd & Richerson, 1996, Rogers, 1988; Henrich & McElreath, 2003). Individual learning is generally conceptualized as the individual's ability to figure out a solution to a problem on its own, while social learning in a wide sense involves the observation of another individual and copying their behavior. Social learning is by no means restricted to humans, it can be found in numerous animal species as well. Various taxa have also been described to form „cultures" (group-specific ways of solving a problem) or establish traditions that are passed on through generations (e.g.: whales (Rendell & Whitehead, 2001), chimpanzees: Whiten, Goodall, McGrew, Nishida, Reynolds et al., 1999), crows: Hunt & Gray, 2003). In animals, however, it has been proposed these social learning mechanisms involve a larger contribution from individual learning processes, such as in the case of local enhancement, where the observation of the other individual helps draw attention to a particular part of the environment or stimulus, but it is up to the learner to figure out what to do (Galef, 1976; Whiten & Ham, 1992). Arguably, certain animal species also show clearer cases of imitation (e.g. chimpanzees: Horner & Whiten, 2005 dogs: Topál, Byrne, Miklósi & Csányi, 2006, marmosets: Voelkl & Huber, 2000); however many researchers suggest that what actually happens in these cases is emulation: learning more about the

environment during observation than the behavior of the model (Tomasello, 1996, Tomasello & Call, 1997). Animal-learning has thus been suggested to be more focused on outcomes and environmental factors than behavioral patterns. Nonetheless, whatever the mechanism, observations of animal societies confirm the notion that certain behavioral patterns are transmitted through generations within groups –resulting in the formation of rudimentary cultures.

However, as described above, an important part of human cultures is the ability to accumulate knowledge: building on the already stored knowledge base when incorporating new pieces of information (Tomasello, Kruger & Ratner, 1993). This requires a certain level of abstraction: the acquired knowledge should not only be activated when the original stimulus is present, but the already acquired pieces of information should be available in the absence of the original environmental factors as well. Thus, social learning described as imitative learning is still not sufficient to account for the transmission and preservation of shared knowledge in humans. Simple imitation fails to inform the learner about at least to important things: 1, what are the relevant aspects of the scene or behavior observed and what are the idiosyncratic elements?; 2, What is the scope of relevance of the learned information? Csibra and Gergely (2006; 2009) have proposed that the human cognitive system overcomes this problem with the help of „Natural Pedagogy", involving the ability to detect the teaching intentions of others (solution to Problem 1) and a propensity to view information presented in a teaching context as generalizable to other contexts as well (solution to Problem 2).

This type of learning can be viewed as a precondition for the preservation of shared knowledge and making cultural evolution possible because as we start accumulating knowledge over generations, cultural practices become more complex and potentially causally opaque by simple observation, making it adaptive for learners to acquire and store information without modification (Csibra & Gergely, 2006; 2009; 2011). Consider the example of a simple, modern-life tool-using behavior: when observing someone make a phone call by entering a number, such as +36 1 1 111 1111, swiping the back of the phone (to clean it) and pressing the button depicting a green telephone, it is adaptive for the learner to reproduce the whole action sequence as it is without modification to arrive at the same consequence (getting in touch with the same person). Entering any idiosyncratic variations into the process without information about the background mechanisms could lead to failure. Without prior information about the

workings of mobile phones, it would be impossible to decide whether swiping or pressing the button (or both) was causally related to the outcome. Since we have to rapidly and efficiently acquire a large body of cultural practices that are in part causally opaque to us at first glance or even remain that way forever (e.g. it is enough to learn how to operate phones without having knowledge of background mechanisms – relying on the assumptions that other people do), deviating from the observed behavior may be costly.

However, it is also clear that blindly imitating everything would result in acquiring a large quantity of irrelevant information or behavioral patterns, selection is thus necessary. The theory of Natural Pedagogy posits that humans make use of communication for this purpose, thus when information is presented in the company of communicative cues, novices encode the presented information as relevant and will learn it without modification (Király, Csibra & Gergely, 2013). The theory also suggests that humans are born with a special sensitivity to cues that signal the communicative intentions of others and that in the presence of such cues, they will encode the presented information as generalizable to other contexts as well (known as the „genericity-bias"). A number of studies have confirmed this notions (Futó, Téglás, Csibra & Gergely, 2010; Butler & Markman, 2012; Yoon, Johnson & Csibra, 2008; Topál, Gergely, Miklósi, Erdőhegyi & Csibra, 2008).The genericity-bias arguably has a key role in the preservation of cultural knowledge, because it fosters the encoding of information that keeps its relevance over different contexts and can be shared between individuals.

Another type of selection involves selecting between informants. Social learning will be most efficient if novices can not only identify teaching situations, but can also discriminate between (culturally) knowledgeable individuals and ignorant ones. There is much evidence in the developmental psychology literature that young children apply selection between potential informants based on a number of characteristics. Importantly, children from an early age seem to be sensitive to cues that imply whether the potential teacher is knowledgeable or not. For example, pre-school aged children are more willing to give credit to the information provided by a person, whose use of linguistic tools imply confidence and certainty in their opinions (Matsui, Yamamoto & McCagg, 2006). Furthermore, Birch, Akmal and Frampton (2010) have shown that already at two years of age, children can make use of non-verbal cues of confidence to select between potential informants. Investigating selective learning processes at an even younger age, Zmyj, Buttelmann, Carpenter and Daum (2010) have shown that 14-month-olds are more

willing to copy the actions of a reliable model, whose tool-using behavior is both confident and in line with cultural practices. At the same age, children trust the information provided by a person whose emotional signals toward a referent has been proven to be reliable more than someone whose signals have been misleading (Poulin-Dubois, Brooker & Polonia, 2011).

Children can also utilize indirect to cues to infer knowledgeability and decide whether to follow the behavior of someone. For example, Zmyj et al. (2012) have found that 14-month-old children are more likely to acquire novel behaviors from adults than children. Children also pay attention to others evaluation of informants and selectively imitate a person to whom other people have attended over a person who has been ignored by others, a phenomenon dubbed as the „prestige-bias" (Chudek, Heller, Birch & Henrich, 2011).

Recently, a number of studies have addressed the question whether children would use information about a person's group membership as evidenced by language use to select reliable teachers. These studies have found that infants selectively attend to information presented by a linguistic in-group member (Marno, Guellai, Vidal, Franzoi, Nespor & Mehler, 2016) and children from 14-months of age selectively imitate an unusual action presented by a native speaker (Buttelmann, Zmyj, Daum & Carpenter, 2013; Howard, Henderson, Carrazza & Woodward, 2015). Importantly, children do not show this kind of selectivity based on the race of the teacher (Krieger, Möller, Zmyj & Aschersleben, 2016). In this case, the racial category of the individual is not seen as relevant as race itself does not inform the learner about the knowledge the person possesses. Depending on the structure of society, people may detect correlations between these features as a result of experience; however, the study of Krieger et al. points to the conclusion that there are no in-built expectations about the knowledge state of a racial out-group person.

Thus, from an early age, children's learning processes are guided by – possibly – innate mechanisms that help children select culturally relevant information and that make children acquire them in a faithful way.

2.2.2. Understanding normativity in young children

Children are not only predisposed to select informants that possess culturally relevant knowledge but also have a tendency to treat the acquired knowledge as normative. That is, once children acquire knowledge about cultural artifacts and behavioral rules, they tend to view it as the „right way to do things". Thus, children seem to have a rudimentary understanding that much of what is passed on in social information exchange situations constitutes *social norms and conventions*. This is related to children's disposition to take information presented in a communicative setting as generalizable (Csibra & Gergely, 2009). Although the genericity bias described in the Natural Pedagogy theory (Csibra & Gergely, 2009) refers to extracting kind-based knowledge and thus generalizing to other objects, another form of extending information beyond the scope of the learning situation involves the assumption that there are other people in possession of the same knowledge. Given the structure of human societies and the stratification of knowledge that comes with it (e.g. Henrich & McElreatch, 2003), an adaptive mechanism would place the boundaries of this generalization to align with the boundaries of certain social groups.

This normative stance (Rakoczy & Schmidt, 2013) of young children entails the assumption that social norms are agent-neutral (Nagel, 1970), thus should govern the behavior of everyone – at least within the same social setting. The most frequently used index of children's understanding of the nature of social norms is their protest behavior when someone violates the norms. A number of studies have shown that children already as young as 2-years of age actively intervene when someone does not keep to norms established for a game (Rakoczy, Warneken & Tomasello, 2008) or a pretense scenario (Rakoczy, 2008). They also seem to grasp the normative nature of object functions and raise their voice when someone uses a familiar artifact for an unexpected purpose (Casler, Terzyjan & Greene, 2009). The same is true for inappropriate use of imperatives and assertions in language use from around the third year of life (Rakoczy & Tomasello, 2009).

From 3-years of age, they also seem to understand that norms and conventions are context dependent and withhold their criticism of others when the violation of the norm happens outside of the established context (Rakoczy, Brosche, Warneken & Tomasello, 2009). Children also differentially enforce norms of games based on the group affiliation

of the violator, being less forgiving toward in-group members (Schmidt et al., 2012). Similarly, Kalish (2012) has shown that pre-school aged children readily generalize the application of social norms to members of the same social category; however the relative role of social category membership as the basis of generalization is diminished compared to individual psychological properties as children mature. Nonetheless, these results point out that children not only understand the agent-neutral nature of social norms but also understand that there is a limit to their application.

The normative stance also plays a role in knowledge acquisition as shown by the phenomenon of „overimitation" (Lyons, Young & Keil, 2007). Overimitation refers to the tendency to imitate causally irrelevant steps of an action sequence in achieving a pre-set goal. In studies on overimitation, the task is typically to obtain an object from a puzzle-box. An adult demonstrates the way to get the object out, while performing unnecessary steps, such as tapping on the top of the box. Interestingly, pre-school aged children and also adults copy these actions even when the irrelevance of the given step is – supposedly – causally transparent for the observer and the instruction simply emphasizes the goal to obtain the object (Lyons et al., 2007; Lyons, Damrosch, Lin, Macris & Keil, 2011; Horner & Whiten, 2005; McGuigan, Makinson & Whiten, 2011). This tendency seems to be human-specific as in similar situations, chimpanzees only overimitate when the puzzlebox is opaque, thus it cannot be determined which parts of the box are connected and whether tapping on top changes something on the inside (Horner & Whiten, 2005).

Different accounts on the mechanism behind the occurrence of overimitation have been proposed. One was dubbed „automatic causal encoding" by Lyons et al. (2011), that proposes that observing a demonstration from an adult evokes the assumption that the elements of the action sequence have a causal relationship with the goal of the demonstration. However, this theory faces a challenge in explaining results that show that the tendency to overimitate increases with age – and thus a more sophisticated causal reasoning ability (McGuigan et al., 2011) On a contrasting view, children overimitate not because of a failure to understand causal relationships but because of a drive to affiliate with the demonstrator (e.g. Over & Carpenter, 2012). Thirdly, and most importantly to our theoretical point of view, it has been suggested that overimitation emerges from humans tendency to view actions as normative due to the propensity to view actions that can be interpreted on different levels (Buchsbaum, Gopnik, Griffiths & Shafto, 2011). Thus, tapping on the box may be seen as irrelevant for the specific goal of obtaining a toy

- much like taking a candybar off of the shelf in a shop and walking it to the cashier instead of simply eating it – but may be a part of a higher-order goal, that is based on social norms (such as using money as a means for realizing labour division). Keupp, Behne and Rakoczy (2013) have provided evidence for the normativity account of overimitation by showing that children not only overimitate, but protest when others do not and they do so even more when the original demonstration highlighted the methods as opposed to the outcome.

The above-described normativity stance has an important role in acquiring knowledge about social conventions. Based on Diesendruck and Markson (2011) conventions have a few distinctive markers differentiating them from other forms of concepts: they are 1, socially conveyed; 2, arbitrary; 3, cognitively opaque; 4, prescriptive and 5, bound to a community.

In the previous section, I have summarized research that had shown that children have a tendency both to view certain types of information as normative (prescriptive) and to limit the validity of these norms to a circle of people, which suggests that children's learning mechanisms are optimized for learning about social conventions. However, how this is achieved is far from obvious. Conventions pose a real challenge for novices because they are neither episodic or idiosynchratic elements of behavior or knowledge, nor are universally valid (Diesendruck & Markson, 2011). Therefore, children not only have to face the challenge of deciding whether the information received in a particular context is bound to the here and now or is generalizable (for the switch between these two, Natural Pedagogy (Csibra & Gergely, 2006; 2009) offers an account), but have to weigh a third alternative: that the information is generalizable but within boundaries. In this dissertation, I suggest that our ability to overcome this challenge can be accounted for by the intertwined nature of social learning and social categorization.

2.3 Hypotheses and outline of the empirical studies

I propose that an adapted system responsible for representing social categories works efficiently and fulfills its evolved purpose if it relates to the core function and characteristics of social groups. As describe above, the success of the human race is largely attributable to the unique form of group living that fosters the formation and

preservation of shared cultural knowledge (Hermann et al., 2007). One of the prerequisites of conducting successful interactions with other people – either in the form of competition or cooperation – is the capacity to have a basic understanding of the knowledge the other person is in possession of. Since a significant part of our lives is inseparable from social conventions and cultural knowledge, making predictions about the behavior of the person will be imprecise without information about whether the person shares cultural knowledge with us. Forming representations of social groups based on cultural knowledge and using such social category representations to make inferences about the epistemic state of people would help us overcome this problem.

Hypotheses 1. *From this reasoning, it follows that humans should be especially sensitive to cues that signal shared cultural knowledge. Language can be seen as one manifestation of shared knowledge, however, other behavioral patterns that are variable across, but stable within groups can serve the same function (e.g. tool-use). This question is explored in Study 1 and 5.*

Study 1 tested whether children would see the parallel between spoken language and tool-using behavior and would expect a person deviating from cultural conventions in tool-using behavior to also speak a foreign language.

Study 5 tested whether adults would also encode social categories based on shared cultural knowledge and whether this classification would have the power to overshadow the significance of racial categories.

For children, this type of social categorization has a special relevance. Among other important things, children must acquire knowledge that will help them become competent members of the specific group they are brought up in. This process will be most successful if children can select between potential sources of information based on cues that imply that one is competent in the ways of a given culture. Thus, we propose that one of the main functions of social categorization for the developing brain is to single out reliable and knowledgeable teachers.

Hypothesis 2. *Children will be less likely to accept information from out-group than in-group members when categorization happens based on cues that provide information about the cultural knowledgeability of the source of information. This question is elaborated on in Studies 2-4.*

Study 2 tested whether children would be more willing to accept information from someone whose group membership is indicated by conventional or non-conventional tool-using habits.

Study 3 was designed to test the claim whether children would be more ready to generalize knowledge about artifacts obtained from a native speaker than from a speaker of a foreign language. Our hypothesis was that if social categorization serves the function for children to point out those individuals who may provide culturally relevant information, children will treat information received from a linguistic in-group as generalizable, but they will not necessarily do so if the information is presented by an out-group member as artifact functions can vary across cultures.

Study 4 was designed to test the flexibility of such selective learning processes. Namely, we tested the question whether the epistemic trust children display towards native speakers can be extended to people speaking in a different language after familiarization with the given language.

3. STUDY 1.

Shared cultural knowledge as the basis of social categorization

The description of the study is based on the following paper: Oláh, K., Elekes, F., Bródy, G., & Király, I. (2014). Social category formation is induced by cues of sharing knowledge in young children. PloS one, 9(7), e101680.

Study 1 was designed to test whether young children would take cues of sharing knowledge other than spoken language as indications of group membership and would use these cues to make inferences about the other characteristics of an individual. As described above, language cues effectively guide children's social preferences and learning processes from a very early age (e.g. Kinzler et al., 2007; Buttelmann et al., 2013, etc.) and these cues have more significance in the eyes of children than race, for example (Kinzler et al., 2009). Language cues may be especially reliable indicators of group membership as there is considerable variation in language use even among societies living in a relatively small area and children are adept at detecting subtle variations in accent from a very early age (e.g. Bahrick & Pickens, 1988; Moon, Cooper & Fifer, 1993).

However, there may be other cues that effectively signal to children whether a person is part of their own cultural group and whether that person possesses knowledge that is valid within the cultural context. In this study, we tested whether 2-year-old children would exhibit sensitivity to norm-violations in tool-using actions and would use these cues to make inferences about other qualities of the person performing the actions. We hypothesized that tool-using actions could be good indicators of cultural group membership as there is something inherently cultural about the way humans use tools and even young children show some sensitivity to the cultural aspect of tool functions. Casler and Kelemen (2005) have shown that already at 2 years of age, children rely on information provided by others to determine the function of an artifact and once it has been demonstrated for them, they view that function as fixed. Children of this age also view these learned object functions as normative and protest when someone uses the tools in a different way (Casler et al., 2009). These results show that children from an early age

view object functions as social constructs and privilage information obtained in a social context over individual judgments of object affordances.

Based on these results, we hypothesized that tool-using behavior could serve as a marker of sharing cultural knowledge and thus could indicate whether a person can be regarded as a member of the same group. In the following studies, we used an eye-tracking method to test this hypothesis. Children were familiarized with videos depicting a male model that performed tool-using actions either in a conventional or a non-conventional way, depending on condition. In the test phase, the model and an unfamiliar person appeared on the screen, while a text was played from the speakers either in a foreign (Experiment 1) or in children's native language (Experiment 2). We measured children's looking patterns to the two photographs as an indication of which they associate the given language with. We hypothesized that children would be more likely to associate the foreign language with the model if he had previously performed the actions in a non-conventional way. We did not have such a strong prediction for the native language as hearing a text in one's native language is probably in line with default expectation and the lack of novelty may not induce such a strong reaction from children.

3.1. Experiment 1

3.1.1. Methods

Participants

Thirty (13 girls; mean age: 24.37 months, SD: 2.27 months) monolingual children between the age of 20 and 28 months participated in the study, of whom 15 were assigned in the *Conventional* condition and 15 in the *Non-conventional* condition. Participants were selected from a database of volunteer families that had previously applied for participation. Children were excluded from participation if there was at least one person in their immediate family whose native tongue was not Hungarian. An additional seven children were tested, but later excluded from the sample due to experimenter error (2); the eye-tracker did not return any data for the given measure and behavior could not be coded by visual observation (2), children could not be calibrated properly (2) and child's parents turned out to be of two different cultures (1).

Equipment

For video stimuli presentation and data collection a Tobii T60XL eye-tracker was used with the TobiiStudio 3.2 software. The screen's size was 52 x 32 cm and 1920 x 1200 pixels. We used a five point calibration throughout the experiment. Children who were included in the final sample provided at least 80% valid eye-tracking data.

Video stimuli

For the familiarization phase, three videos were created for each condition (*Conventional* and *Non-conventional*). In each of the videos, a male model performed a goal-directed action with a chosen tool. The three videos depicted three different tool-using actions. The setup in the video always included two visible goals (e.g. a plate of food and messy hair) and two possible tools to bring the goals about (e.g. a fork and a brush). In all the videos the model first non-verbally, but explicitly demonstrated his goal by reaching for one of the goal-objects. Then he grabbed one of the tools, examined and then rejected it (shaking his head). After that he grabbed the other tool, nodded on examining it, and then used the tool to bring the goal about. After the goal had been attained, he expressed satisfaction by nodding at the outcome. Importantly, in both conditions all the goals and possible tools were familiar to the children, but in the *Non-conventional* condition the associations between tools and goals were unfamiliar (e.g. using a fork to brush his hair), while in the *Conventional* condition associations were always familiar (e.g. using a fork to eat food). The length of the videos varied between 16 and 20 seconds. For detailed description of the videos see Appendix 1. Note that in both the Conventional and Non-conventional condition, the tool that was chosen by the model could efficiently bring about the outcome. Moreover, in both conditions, the model performed the action with equal confidence, and without communicating with the participant in any way (he did not look into camera, did not smile, wave, etc.). Thus, the familiarization events only differed in their level of conventionality.

Procedure

On arriving to the laboratory, children had some time to explore the room and get comfortable in the company of two experimenters, while parents were briefed about the experiment and signed informed consent. After this, one of the experimenters escorted the child and their parent into the testing room and seated them in a chair in front of the monitor of the eye-tracker (at a distance of approx. 60-70 cm) with the child sitting on the parent's lap. The experimenter assisted with calibration, but left the room once it was finished. Before the stimuli began, the model entered the room and started manipulating the computer without looking at or talking to the children. This element of the procedure was added in order to avoid the possibility that in-group and out-group effects were weakened by the fact that it was the in-group experimenter that directed children's attention to the stimuli. After the model had also left the room, children were presented with the three familiarization videos. Children always saw either three *Conventional* on three *Non-conventional* videos, depending on condition.

The familiarization phase was immediately followed by the test in which two photographs appeared side-by-side on the screen. The pictures were 21 x 11 cm and were positioned on the left and the right side of the screen with a 10 x 11 cm line in the middle, separating them. One picture depicted the model, while the other photo was taken of another young man matched in age. After 6 seconds had elapsed the voice of a man was heard from the speakers, who spoke in Swedish for 14 seconds.

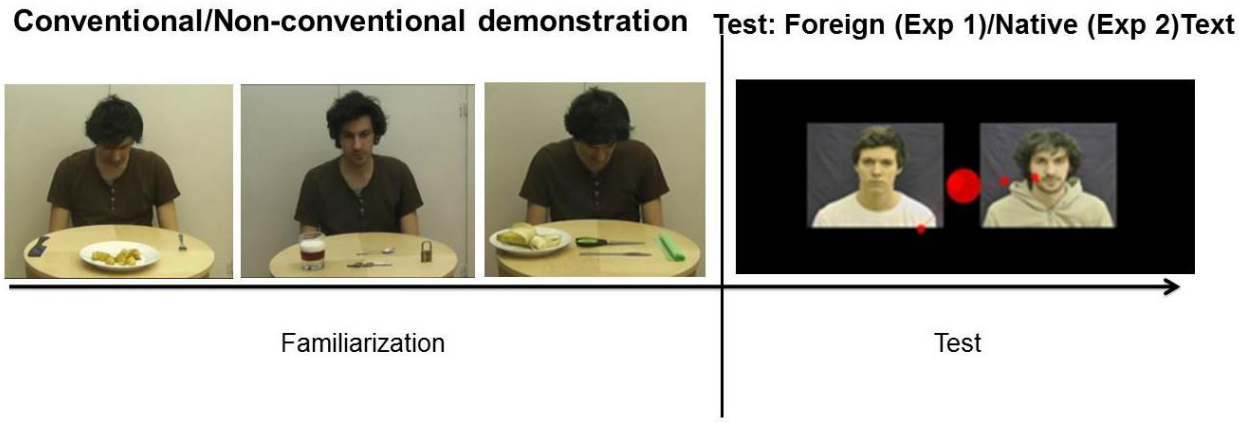

Figure 1. Structure of the experimental design.

Data analysis

Four groups of area of interest were created for analyses combining two factors: who was the target person (model or the other person) and time window (before the onset of the audio stimulus and after). The cut-off point was set at eight seconds, which marks the end of the first utterance; therefore by this point children already had the opportunity to judge the familiarity of the language. The length of the *before* time window was 8 seconds, while the *after* time window lasted for 12 seconds.

To test whether children differentially associated the foreign language to the two men in the test phase based on experimental condition, we analyzed the direction of their first gaze on hearing the foreign language. This measure was introduced in order to detect the potentially organized information seeking by children: if conventionality of tool use induces social categorization based on shared knowledge, children could use this information to integrate the novel stimulus as well. Children were expected to associate foreign language use with the model only after non-conventional tool use, since both cues point to the model's possessing different cultural knowledge than the participant - thus children would look first at the model. On the other hand, in the case of conventional tool use, children were hypothesized to search for the source of the foreign language utterance by looking first at the novel human face, since there was a mismatch between the social categories induced by the two different cues.

We also analyzed total visit duration in both time windows to explore any possible general preference towards either of the models. In addition, we analyzed total visit durations for the familiarization videos in order to exclude the possibility that children were more attentive in the *Non-conventional* condition due to the surprising behavior exhibited by the model.

3.1.2. Results

Sex and age were first always entered into the analyses, but were not significant and were therefore removed from all models.

An independent samples T-test was performed on the percentage of looking at the three familiarization videos with condition as a between subject variable. The analyses

revealed a marginal effect of condition ($t(29) = 1.99$, $p = 0.057$), showing that children attended to the videos slightly more in the Conventional condition (Mean percentage of looking in the Conventional and the Non-conventional condition: 98 and 94 percent, respectively).

Repeated measures GLM analyses on the total visit durations (factors: target person *[model* vs. *other*], condition [*Conventional* vs. *Non-conventional*]) were performed separately for the *before* and the *after* time window in the test phase, which revealed a general preference towards the model ($F(1,28) = 13.36$, $p = 0.001$) *before* the onset of the audio stimulus (Mean looking times: *Conventional* condition/model: 2.84 sec; *Conventional* condition/other: 2.05 sec; *Non-conventional* condition/model: 2.79 sec; *Non-conventional* condition/other: 2.23 sec). This preference disappeared in the *after* time window (Mean looking times: *Conventional condition*/*model*: 2.59 sec; *Conventional condition/other*: 1.99 sec; *Non-conventional/model*: 2.19 sec; *Non-conventional/other*: 2.36 sec). See also Figure 2.

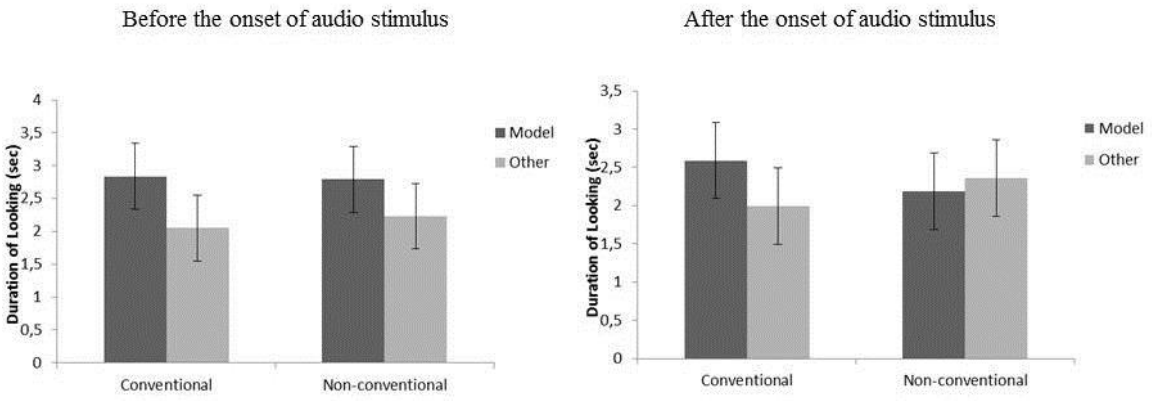

Figure 2: total looking times in the test phase of Experiment 1. *The duration of overall looking times at the two photographs (depicting the model and the other person) in the Conventional and Non-conventional condition, presented separately for the periods before and after the onset of the foreign language stimulus.*

Crucially, analyzing the directions of the first fixations we found a significant effect of condition in the *after* time window ($\chi^2(1) = 4.821$, $p = 0.028$) showing that after the onset of the foreign language text (after time window), children were more likely to

look at the *model* in the *Non-conventional* condition (10 out of 15 children), whereas the majority of children fixated on the *other* person first in the *Conventional condition* (11 out of 15 children). Results are depicted in Figure 3. No significant effect of condition was found *before* the audio stimulus (χ^2 (1)= 2.4, p = 0.12).

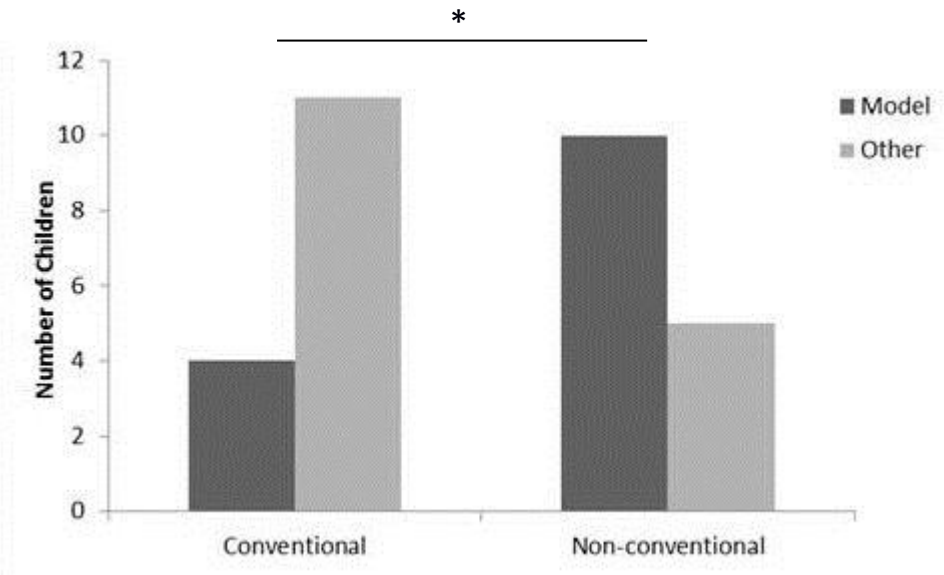

Figure 3. distribution of first fixations after the onset of the audio stimulus in Experiment 1 of Study 1. *Number of children looking first at the model and at the other person in the Conventional and the Non-conventional condition after hearing the foreign language text.*

3.2. Experiment 2

Experiment 2 was designed to test whether similar results could be obtained using the children's native language instead of a foreign language. Since first fixations can be regarded as part of an information seeking process after a certain stimulus, we expected it to be more indicative of children's cognitive processes after events that violate their expectations. Due to the fact that hearing people speak in our native tongue is such a strong part of our every-day experiences, we hypothesized that it would not elicit any specific cognitive processing, leading to a random pattern of first fixations in the two conditions. However, this study provides important additional information for interpreting

the above described results and exploring the validity of the hypothesis that cues of shared knowledge may play a part in forming representations of social groups.

3.2.1 Methods

Participants

Twenty-six (10 girls, mean age: 24.32 month, SD: 2.28) monolingual children participated in the study with equal number of children assigned in the two conditions (*Conventional* and *Non-conventional*). The criterion for participation was the same as in Experiment 1. An additional three children were excluded from the sample due to inattentiveness.

Materials and procedure

The applied stimuli and the procedure were identical to the ones used in Experiment 1 with the exception that during the test phase, the Swedish audio text was replaced by a Hungarian (native) text. The length of the audio stimulus and the duration of the first utterance were matched to those in Experiment 1.

3.2.2. Results

Age and sex were first entered into all of the models used in the analyses, but were later removed as they were not significant in any of the cases.

Pair-wise analysis of the percentages of the aggregated looking times during the three familiarization videos revealed a significant effect of condition, with children looking overall longer in the *Conventional* condition ($d(25) = 3.08$, $p = 0.009$). However, the difference between looking times was relatively small with a mean of 99 percent in the *Conventional* condition and 95 percent in the *Non-conventional* condition.

A GLM analysis on the total visit durations in the test phase yielded a significant effect of condition ($F(1, 24) = 24.34$, $p < 0.001$) and target person ($F(1, 24) = 4.34$, $p = 0.048$) in the *before* time window. Children spent more time looking at the model than at

the other person and they looked longer in the *Non-conventional* than the *Conventional* condition (*Conventional/model*: 2.82 sec; *Conventional/other*: 1.99 sec; *Non-conventional/model*: 3.55 sec; *Non-conventional/other*: 2.53 sec). No effects were found in the *after* time-window (*Conventional/model*: 2.69 sec; *Conventional/other*: 2.21 sec; *Non-conventional/model:* 2.65 sec; *Non-conventional/other*: 2.47 sec, see also Figure 4.).

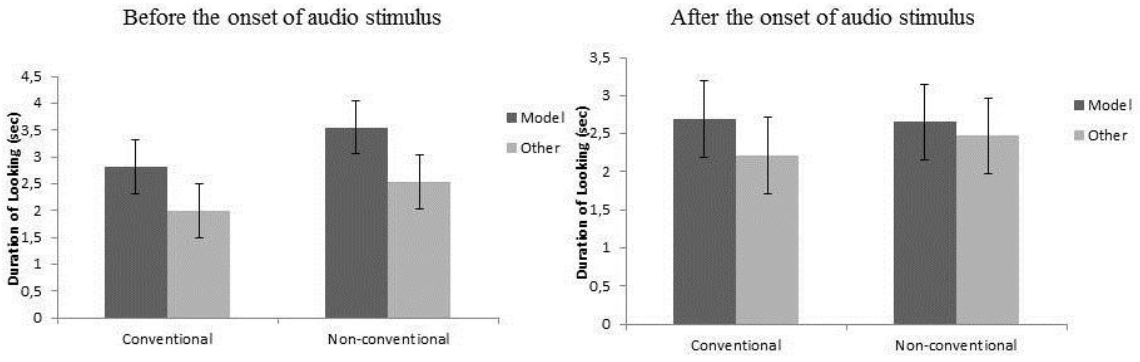

Figure 4: looking times in the test phase of Experiment 2 of Study 1.*The duration of overall looking times at the two photographs (depicting the model and the other person) in the Conventional and Non-conventional condition, presented separately for the periods before and after the onset of the native language stimulus.*

Analyzing the direction of the first fixations we found an effect of the experimental condition in the *before* ($\chi^2(1) = 3.85$, $p = 0.05$) time window showing that most of the children in the *Conventional* condition fixated on the *model* first (9 out of 13 participants) while the majority of children in the *Non-conventional* condition fixated on the *other* person first (9 out of 13 participants). However, *after* the onset of the stimulus there was no difference between conditions ($\chi^2(1)= 0.16$, $p = 0.69$) with approximately the same number of children looking at the model first in both conditions (7 and 8 in the *Conventional* and *Non-conventional* condition, respectively). Results are depicted on Figure 5.

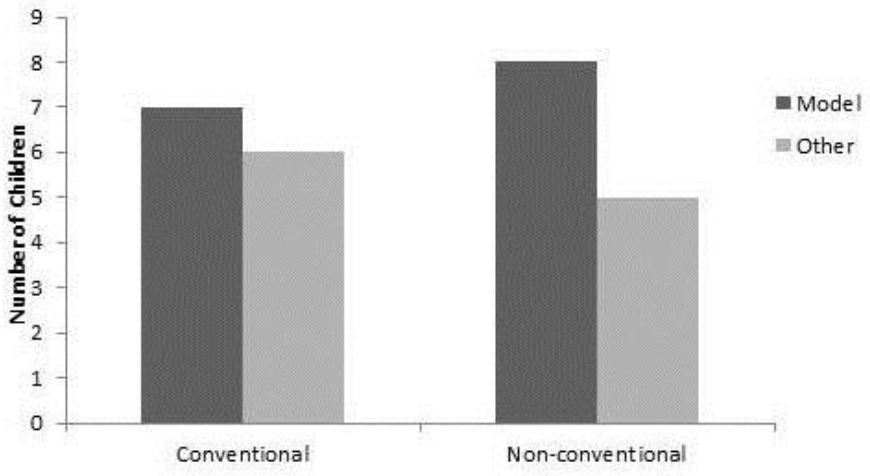

Figure 5: distribution of first fixations after the onset of the audio stimulus in Experiment 2 of Study 1. *Number of children looking first at the model and at the other person in the Conventional and the Non-conventional condition after hearing the native language text.*

3.3. Discussion

In this experiment, we investigated whether 2-year-old children form similar representations of a person based on the observed level of conventionality in their tool using habits as they do based on the language they speak. This design allowed us to test whether children would associate a foreign and a native language differentially to people based on the conventionality of his behavior. We found that children associated a foreign language to the model if he had previously performed goal-directed actions in a non-conventional way, but formed an association between the foreign language and the other person if previously the model had been seen to act in a conventional way, making it unlikely that he was the source of the foreign language utterance. On the other hand, we found no evidence of children differentially associating a native language to the two men. The latter result indicates that different characteristics along which we form judgments about a person (or possibly about social group membership) may be organized hierarchically, and language represents a stronger cue than certain other qualities. Children meet a vast number of people every day that differ along countless traits but with a few exceptions they share a commonly spoken language. Therefore, hearing a text in their native language will come as no surprise to them and will probably not elicit such

a strong response from children. Supposedly this is reflected in the fact that we found no differences in Experiment 2.

First fixations were chosen as the subject of analyses as an indication of participants' expectation about who is more likely to be the source of the foreign language. Since children were presented with photographs, the question of to whom the voice belongs is rather ambiguous, which becomes evident to participants once they start to visually explore the static stimulus. However, the direction of the first fixation provides information about children's expectations before the realization that the visual stimuli will not help clear the ambiguity.

Analyzing the total visit durations in the test phase, we found a preference towards the model before the onset of the audio stimulus. This suggests that familiarity did have an effect in the test phase, but preferences based on mere familiarity faded away by the time the audio stimulus started and were also suppressed by the conflicting information that was provided about the model's behavioral habits (this is reflected in the between-conditions difference in first fixations in Experiment 1 and the even distribution of first fixations in Experiment 2).

Our results suggest that children take the familiarity and the conventionality of performed actions into account in forming representations about a person, and they generalize to other qualities (in this case, language) of the person based on this information. The phenomenon that even young children organize information about people systematically has been recently shown in a study where 6-month-old infants matched a non-native language to an other-race face (Uttley, de Boisferon, Dupierrix, Lee, Quinn et al., 2013). This study, similarly to ours analyzed the looking-time patterns with photographs and spoken texts as stimuli.

Spoken language has been shown to occupy a prominent role in children's representations of humans. Children not only prefer people belonging to the same linguistic group as themselves (Kinzler et al., 2007), but they extend this preference to objects associated with a linguistic in-group (Kinzler et al., 2012), and they selectively learn from people speaking their own language (e.g. Buttelmann et al., 2013). This study has demonstrated that these representations are not constrained to the domain of language but are possibly part of a wider module designated to reason about humans in terms of familiarity and conventionality of their behavior. These characteristics are ultimately

indications of whether a person is in possession of the same cultural knowledge as oneself.

In sum, this study has demonstrated that young children rely on the familiarity of tool using actions in forming judgments about a person and these representations are convergent with the ones based on language use. We propose that these two characteristics are alike in that they both belong to the body of culturally accumulated and shared knowledge.

4. STUDY 2.

Selective imitation of conventional tool-users

The manuscript of this study is currently under review in Cognitive Development: Oláh, K. & Király, I. (under review). Young Children Selectively Imitate Models Conforming to Social Norms. Cognitive Development.

Study 1 has demonstrated that children form similar representations based on the language a person speaks and the level conventionality they exhibit in their tool-using behavior. Following up on the above demonstrated results, Study 2 aimed to investigate whether children would selectively imitate a model whose behavior conforms to the cultural norms over someone who violates the cultural norms. As described in the introduction, we hypothesized that one of the main functions of social categorization in childhood is to identify reliable teachers whose knowledge is worth acquiring. Previous studies have shown that young children use linguistic cues to select between informants (Shutts et al., 2009; Kinzler et al., 2012; Buttelmann et al., 2013; Howard et al., 2015). Study 2 explores whether similar selectivity would be observed when the potential teachers do not differ in the language they use, but in their usage of familiar tools.

In addition, we also tested how ostensive communication would modulate any potential effect of the model's group membership. According to the theory of Natural Pedagogy (Csibra & Gergely, 2009), an innate sensitivity to ostensive-communicative signals foster the transmission of culturally relevant knowledge in humans by pointing out the to-be-acquired information. For humans, this is of special importance since much of the cultural knowledge is causally opaque to the observer and relevant and irrelevant information would be impossible to separate by simple observation (Gergely & Csibra, 2006). Evidence suggests that young children's learning processes are in fact guided by the ostensive cues, making them more willing to faithfully imitate causally opaque actions following an ostensive-communicative demonstration (e.g. Király et al., 2013).

Thus, communicative signals and the different qualities of the teacher both serve to help children acquire culturally relevant knowledge; however, little is known about how these cues interact with each other in forming the behavior of children. One possibility is that children only attend to the communicative intentions of others if the

person has been proven to be a reliable source of information. In this case, children would be equally (un)willing to imitate an out-group model following a communicative and a non-communicative action demonstration, but they would show increased motivation to copy the actions of a an in-group model after a communicative demonstration. The second possibility is that children's tendency to accept knowledge in a communicative setting is so strong that it overwrites the significance of cues of group membership. In this case, children would imitate a model that gives ostensive signals irrespective of group membership and would only start differantiating based on group membership in the absence of such cues. This is also plausible given that despite the supposed innate nature of the tendency to form representations of social groups, the content of relevant groupings should be filled in during development before it can effectively guide behavior. Although one might argue that humans are innately sensitive to certain cues – such as race (but see the Introduction for a review) –, determining whether someone shares cultural knowledge with oneself is reliant on previously accumulated knowledge about certain cultural practices. Thus, at first, children may not have other cues to rely on but cues that signal the teaching intention of those around them. Relatedly, the last possibility is that the relative importance of group membership and ostensive-referential signals change during development. (However developmental changes will not be explored in the study presented here.)

In study 2, we presented children with videos introducing two models, one of whom performed conventional tool-using actions, while the other used the same tools in an unconventional way. After that, both models demonstrated how to build a tower from building blocks either in a communicative or a non-communicative way. The two demonstrations varied in one element and we analyzed whether children would be more willing to copy the variant introduced by the conventionally behaving model.

4.1. Methods

Participants

50 3-year-old children participated in the study (mean: 39.3 months; SD: 2 months; range: 34-43 months). Children were either tested in one of two kindergartens (n=38) or in the baby lab (n=12). All children were monolingual. 5 children had to be

excluded from the *Ostensive* condition due to passivity (1); having a distracting toy in their hand during testing (1); touching the apparatus too early (1) or not paying attention to the demonstration videos (2). The final sample consisted of 21 children in the *Ostensive* condition and 24 children in the *Non-ostensive* condition.

Materials

For the familiarization phase, two sets of videos were recorded of two protagonists. The videos depicted simple tool-using actions based on the stimuli developed for Study 1. Each protagonist demonstrated two different tool-using actions either in a conventional way (cutting up a piece of paper using a pair scissors and having a bite of food with a fork) or in an unconventional way (cutting up a banana using a pair of scissors and combing one's hair with a fork). Each demonstration video was recorded with both protagonists in both manners. In addition, test videos were recorded with the protagonists that also had two different versions. The demonstrated action was a tower building technique, where the protagonist showed how to build a tower from three (or four) building blocks: a blue building block that was used as the base, a yellow middle section and a red top. Crucially, the middle section could be built either from a single double block or by adding two single blocks (see Figure 7.). All test videos had an ostensive-communicative and a non-communicative version and all versions were recorded with both participants. In the ostensive videos, the protagonist started the demonstration with looking into a camera, waving and saying „Hi". She finished the action by looking back up into the camera. In the non-ostensive videos, she simply started the demonstration with reaching for the first building block and did not look back at the camera in the end.

Procedure

Children were tested individually either in a quiet room of the kindergarten or the laboratory. After escorting the child into the testing area, the experimenter told the participant that they would be watching short movies of two girls and that they should pay close attention to what happens. After that, the experimenter played the familiarization and the test videos. Each participant saw one of the protagonists perform

both of the familiarization actions in a conventional way, while the other protagonists performed both actions in an unconventional way. With this, we wanted to create the impression that one protagonist consistently behaves according to social norms, while the other consistently deviates from them. Importantly, their actions were always performed in a confident way and were efficient in bringing about the desired goal. Children first watched the „fork action" being performed by both protagonists and then saw the second action („scissors action") being performed by the two models in the order they appeared in the first pair of videos. After the familiarization videos, the two test videos immediately followed. Children saw one of the participants perform the tower building action with constructing the middle section from two pieces and the other protagonist building the middle part from one piece. Both participants performed the test action either in an ostensive way (*Ostensive* condition) or in a non-ostensive way (*Non-ostensive* condition). The following factors were counterbalanced across conditions: identity of the conventionally behaving model, the variant of the building technique performed by the conventionally behaving model and the order of appearance of the two models.

Figure 6. Demonstration of the conventional or unconventional tool-using habits.

Figure 7. Two alternative ways to build the tower.

Coding

We coded whether children would choose to build the middle section from one block or two. Since children introduced significant variations into the building procedure, the following criterion was used: if children took either the double building block or the two separate pieces and placed them on the building block serving as base, then this was considered a clear choice irrespective of how they continued the building (in many cases, children ended up using up all the building blocks to build an even higher tower). If this element was missing or was performed in a completely different way (e.g. putting the two separate blocks on top of each other), then the behavior was coded as an alternative solution. A second coder coded 60% of the videos. All discrepancies between coders have been discussed and resolved.

4.2. Results

Statistical analyses were performed in SPSS 20.0. Our main question was whether children would be more willing to imitate a conventionally behaving model than a person violating the cultural norms. Therefore, our dependent variable was which model children imitated. After coding the videos, we observed that a large proportion of participants came up with an alternative solution. For this reason, first we analyzed all the data, including children with alternative solutions. In this analysis, we used a dependent variable with three possible values (imitating the conventional model/imitating the unconventional model and alternative solution). Additionally, we performed an analysis that included only children with clear choices (children following one protagonist).

To test the effects of condition on children's choices between the conventionally and unconventionally behaving model, we first conducted regression analyses with choice of model as the dependent variable and condition (*Ostensive/Non-ostensive*), identity of the conventional model, order of presentation of the models, variant performed by the conventional model, testing location, age and sex as predictor variables. Since none of the predictor effects reached significance (all $p>0.76$ for the analyses excluding alternative solutions and all $p>0.904$ for the analyses including alternative solutions), we restricted the analyses to the factors of interest (choice of model and ostensiveness of the demonstration) for our research question and used Chi-square tests. Additionally, we conducted tests of distribution to explore whether children were generally more inclined to imitate the conventionally behaving model (Kolmogorov-Smirnov test for the variable with three values and binomial test for the one with two values).

Analyses Including All Participants

The results of the Chi-square tests show that there was no difference between conditions in the number of children choosing to follow either of the models or opting for an alternative solution ($\chi^2(2)=0.277$; $p=0.87$). The results show that more than half of the children in both conditions imitated the variant introduced by the conventionally behaving model with around the same number of participants choosing to copy the unconventionally behaving model and to come up with a new method of tower building (see Figure 8.). Analyzing the distribution of behavior types across conditions, we found a significant difference between the different response types ($Z=2.311$; $p<0.001$), showing that participants performed the variant they had seen from the conventionally behaving model most often.

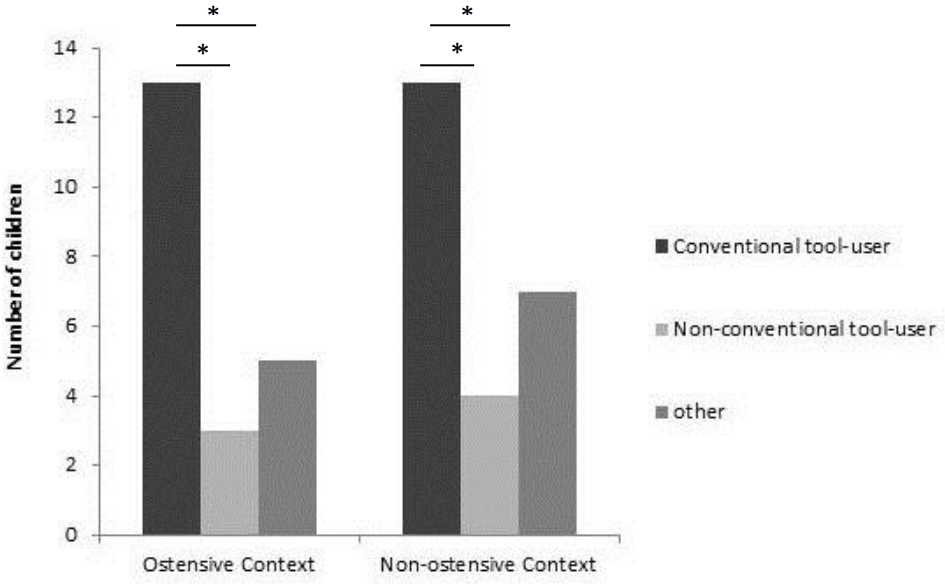

Figure 8. Number of children imitating the variants introduced by the two models or opting for an alternative solution in the Ostensive and the Non-ostensive conditions.

Analyses Excluding Alternative Solutions

Due to the fact that they came up with a novel building method, 12 children were excluded from this analysis, leaving 17 children in the *Non-ostensive* and 16 children in the *Ostensive* condition. Similarly to the results of the first analysis, we found no difference in the distribution of behavior types between the conditions ($\chi^2(1)=0.113$; $p=0.737$); showing that the majority of children imitated the conventionally behaving model in both conditions (n=13 in both conditions). A binomial test showed that children were altogether significantly more likely to perform the variant introduced by the conventionally behaving model ($p=0.001$). The results are depicted on Figure 9.

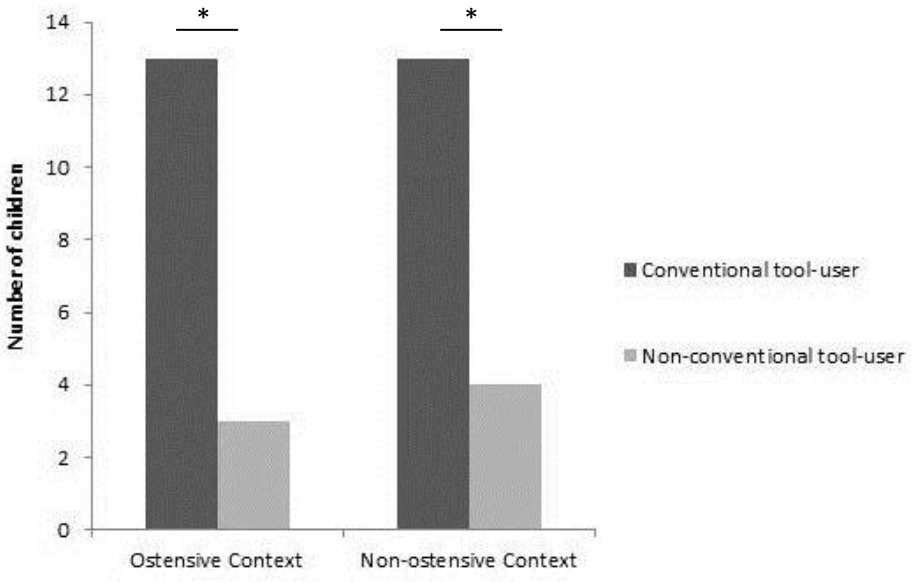

Figure 9. Number of children imitating the variants introduced by the two models in the Ostensive and the Non-ostensive conditions (excluding alternative solutions).

4.3. Discussion

This study tested whether 3-year-old children would selectively imitate a model whose competence in cultural knowledge was indicated by their tool-using habits. The results confirmed the hypothesis, showing that children were more willing to learn from someone whose behavior conformed to the cultural norms over someone who violates the culturally established norms. Study 1 provided evidence that the same behaviors that we used for familiarization in this study are associated with language use in children's representations. Therefore, we propose that there may be a parallel in the selection mechanisms of children's learning processes exhibited in our study and those showing selectivity based on linguistic cues (e.g. Buttelmann et al., 2013; Howard, et al., 2015, see also Study 3). Both of these cues (language and conventionality in tool-using behavior) imply familiarity with the ways of a given culture; therefore these selection mechanisms ensure that children endorse information that will likely be useful within their own environments.

The results also show that the selectivity based on the models' prior behavior was not affected by the expression of communicative intentions in the test phase: children

were just as unwilling to follow the behavior of an unconventionally behaving model in this case as they were when the models performed the actions in a non-communicative way. Thus, it seems that toddlers first identify the circle of reliable teachers and are reluctant to respond to the teaching intentions of those who fall outside of this circle. It is important to note that our study applied a forced choice method where children were always presented with a variant both from the conventionally and the unconventionally behaving model. Thus, it is possible that since children could not simply base their decisions about whom to follow on the perception of teaching intentions, they looked for other cues that could serve as guidance. We cannot be absolutely sure whether children would not imitate someone who does not keep to the cultural conventions but expresses their intentions to pass on knowledge if they are not presented with an alternative. However, similar studies on selective imitation of linguistic in-group members usually apply a between subjects method and work with a communicative demonstration and also report reduced imitation rates of an out-group member (e.g. Howard et al., 2015, but see Buttelmann et al., (2013) for the same finding in a not particularly ostensive context). Thus, given the parallels between children's reactions to linguistic out-group models and non-conformists to cultural norms, we would expect to see similar reluctance to imitate the latter following a communicative demonstration even when no alternative is presented.

Note that in our design there were no conditions that directly pitted ostension againtst conventionality, that is, where one model was conventional but produced no communicative signals, whereas the other behaved in a non-conventional way but expressed their willingness to teach. The reason for this choice was the fact that, based on previous findings, it would have been a viable prediction that both signals have equal significance in children's eyes and thus, they would choose at random (i.e. half of the children imitating one model, while the other half imitating the other model). This pattern of results would have been difficult to interpret as it could also be attributed to low-level cognitive mechanisms resulting in a random choice. Thus, it would have been impossible to differentiate between these two explanations.

We believe it very likely that the relative importance of communicative cues and cues about cultural identity undergoes significant changes in the first years of life. It is possible that both the sensitivity to ostensive-referential signals (Csibra & Gergely, 2006) and the tendency to select teachers based on perceived group membership have innate

roots; however, the latter is more strongly dependent on already stored information. Therefore, it may be adaptive for younger children to learn everything presented in a communicative context and later use the accumulated knowledge as anchors in subsequent learning episodes. It may also be an efficient strategy considering that the circle of people children meet in the first months of their lives is usually much more limited than in later years and is less likely to include people who may otherwise not be a part of the wider social group of children and would therefore communicate knowledge that is not valid for children.

An important question that arises is whether the unconventional behaviors used in the familiarization phase in our study would lead children to form the impression that the person does not share cultural knowledge with themselves and consequently cannot be regarded as a member of the same cultural group. Children could have simply inferred that the person is „ignorant", „funny" or a „rule-breaker". A number of studies have shown that children show selective learning based on similar behavior cues implying that the knowledge of the potential teacher is not reliable (e.g. Pasquini, Corriveau, Koenig & Harris, 2007; Koenig & Harris, 2005). The study by Zmyj and colleagues (2010) applied a very similar method to ours where they introduced a model whose behavior deviated from the cultural norms and importantly, who also signaled uncertainty about how to use the tools in front of him. In our study, the models always performed the actions with confidence in order to suggest that the person was not lacking knowledge, simply possessed different knowledge about the usage of the tools. Nonetheless, it is possible that children at this age do not differentiate between the two cases and treat both an uncertain model and a confident, but unconventionally behaving one as equally ignorant. Future research may address this question. However, even if children may not make the difference, the fact that they base their judgments about knowledgeability on conventionality of behavior is in itself informative. There may be other cues that could serve equally well as guidance about knowledgeability if the concept did not inherently include familiarity with cultural practices. For example, children could rely more strongly on cues of confidence or on the efficiency of the observed action. In our familiarization videos, the unconventional actions were always efficient in bringing about the highlighted goal. Children could also make the assumption that a person who finds a way to arrive at their goal is worth following, however this was not the case: familiarity with the means to the goal played a crucial role. Moreover, mere familiarity was not sufficient to evoke trust

as both the goal and the means were familiar in all the cases. „Unconventionality" was defined as the unexpected association of the two (otherwise familiar) elements of the actions, therefore beyond a sense of familiarity, top-down mechanisms sensitive to more subtle characteristics of the organization of behavior had to play a part. Thus, we suggest that for children (and adults as well), „knowledgeability" always includes familiarity with cultural practices. Therefore, even if children cannot explicitly postulate this, an unconventionally behaving person is not simply „stupid" but not being a good (conformist) member of a given social group as they do not share the established cultural knowledge.

To our knowledge, this study is the first one to show that language may not be the only relevant cue that provides grounds for selectivity in learning through signaling access to a specific body of cultural knowledge. We propose that tool-using habits and language both show children whether the interaction partner shares cultural knowledge with them and are reluctant to learn from someone who appears ignorant in this respect. This selectivity ensures that children accumulate knowledge that is valid and useful in their social environment and filter out irrelevant pieces of information from the exceess of stimuli reaching their cognitive system. We propose that the same sensitivity to known and unknown behavioral patterns (conformity to established practices) guiding children's learning processes helps humans navigate a world filled with multiple dimensions of subcultures in adulthood as well.

In sum, Study 2 shows that 3-year-old children selectively endorse information provided by someone who exhibits familiarity with cultural practices. This selectivity ensures that children accumulate knowledge that is valid and useful and avoid endorsing behavioral patterns that are disfunctional in their (social) environment.

5. STUDY 3.

Children selectively generalize object functions following a demonstration from an in-group member: evidence from the phenomenon of scale error

The description of the study is based on the following published paper: Oláh, K., Elekes, F., Pető, R., Peres, K., & Király, I. (2016). 3-Year-Old Children Selectively Generalize Object Functions Following a Demonstration from a Linguistic In-group Member: Evidence from the Phenomenon of Scale Error. Frontiers in psychology, 7.

A relevant question concerns children's learning about object functions from in-group members, since humans' habits in using artifacts have an inherently cultural aspect. While an artifact may be appropriate to bring about several different goals, a very specific function is usually assigned to them during production. Adults and older children have a strong propensity to define object categories by the intended function, known as the *design-stance* (Dennett, 1989). Casler and Kelemen (2005) have shown that the precursors of this can be found in children as young as 2 years of age. Children of this age seem to represent objects as existing for certain purposes and view this purpose as an intrinsic property of the given object (*the teleo-functional stance*) – though they cannot yet explicitly give explanations in terms of the design-stance. It follows from such a conceptualization of artifact functions that they are not strictly or exclusively determined by the physical properties of the object, but that there is a partly arbitrary or incidental element in the process of assigning functions to objects. This arbitrary component makes object functions variable across cultures. Thus, object functions constitute a part of our cultural knowledge (e.g. whether we use a fork or chopsticks for eating).

Another important quality of object functions is that they are generally causally opaque by simple observation (Csibra & Gergely, 2009), therefore novices must rely on culturally knowledgeable individuals to pass on information about the intended function. In this study, we build on the phenomenon of scale error to investigate whether children can flexibly modulate their learning processes in response to the cultural group membership of the person demonstrating the object function.

The term scale error refers to young children's tendency to disregard the actual size of the object they are interacting with when the object category is familiar to them.

As a consequence, for example, they may try to slide down a miniature slide or try to squeeze themselves into a matchbox sized car (DeLoache, Uttal, & Rosengren, 2004). DeLoache et al. (2004) have demonstrated this phenomenon in children aged 18-30 months in a free-play setting and suggest that it may stem from an inability to integrate information from distinct processes in visual perception and from a lack of inhibitory control. Specifically, when children encounter an object that activates the representation of a kind of object, an action plan is formed based on stored knowledge of the object category. This action plan, however, does not become inhibited by size information as it would in the case of adults or older children. DeLoache et al. (2004) propose that this may be due to the lack of integration of information processed by the ventral and dorsal visual stream (Milner & Goodale, 1995) or a dissociation between action planning and control (Glover, 2004). Since the study by DeLoache et al. (2004), a number of studies have confirmed the robustness of scale errors (e.g. Rosengren, Gutierrez, Anderson & Schein, 2009; Ware, Uttal & DeLoache, 2010).

Casler, Eshleman, Greene and Terziyan (2011) have demonstrated the same phenomenon in two-year-old children with instrumental tool-use in a structured setting. In this study, children were presented with novel and familiar object sets. In the first phase of the experiment, a model demonstrated how to use the tools to achieve certain goals. Afterwards, children received the object sets with one alteration: the original tool was replaced by one that was either too big or too small to efficiently bring the goal about. Additionally, they received a novel object that was appropriate for goal attainment, but had not been presented during the demonstration. Under such circumstances, 2-year-old children committed scale errors 31% of the time. Casler et al. (2011) argue that a proneness to committing the scale error may originate from the early-emerging teleo-functional stance (Casler & Kelemen, 2005), that is, to view artifacts as existing to serve certain functions. As a consequence, the function of the tool is incorporated into the representation of the object kind and when the category representation becomes active, it inevitably activates the representation of the task the object is for.

In this study, we build on the assumption that scale errors occur with tools due to the fact that function constitutes an inherent part of stored knowledge about object categories (Kelemen & Carey, 2007). We propose that this makes the phenomenon of scale error sensitive to the context of knowledge acquisition. Research suggest that learning about object kinds happens with the help of specialized learning mechanisms that

allow the observer to efficiently gain culturally relevant information about a category of objects from a single demonstration (e.g. Futó et al., 2010; Butler & Markman, 2012; for a general description see the Natural Pedagogy Theory, Csibra & Gergely, 2006;2009; Gergely & Csibra; 2006). However, as described in the beginning of this review, efficient learning also requires an ability to select knowledgeable teachers, who can provide valid information. Since the appropriate usage of artifacts is part of the culturally shared knowledge, reliable teachers should be familiar with cultural practices – should be cultural in-group members. Therefore, we hypothesized that if tool functions were presented by in-group models, children would be more prone to subsequently committing scale errors since the demonstrated function would be more likely to be incorporated into the representation of the object. On the other hand, perceiving the informant as an out-group member could lead children to suspend their default stance to encode the information obtained in a communicative context as generalizable. We followed the methods of Casler et al. (2011) with the modification that the demonstrator was either presented as a speaker of children's native language or a foreign language.

5.1. Methods

Participants

Participants were 37 monolingual Hungarian children (14 girls) recruited through advertisements in the local area. Their ages ranged from 30 to 40 months, with a mean of 33. 31 months (SD=2.69). Children were randomly assigned to either the *Native (n=17)* or the *Foreign (n=20)* language condition. An additional 9 children were tested but later excluded from the sample due to passivity (3), camera failure (3), experimenter error (2), the child was bilingual (1).

Materials

The object sets used in the study were inspired by three of the object sets used in the study of Casler et al. (2011). Each set consisted of a target object and three potential tools. There was one tool used in the demonstration phase and two presented in the test phase. One tool used in the test phase was identical to the one introduced during

demonstration except for size, whereas the other testing tool was an alternate to the originally presented one with different perceptual features but corresponding size and affordances. The first object set could be used to paint on paper and consisted of a container with blue paint mixed with water inside (11x10.5x5 cm), a small paintbrush (19 cm long with a 3.5 x 1.5 cm head), a larger paintbrush that could not fit into the container (24 cm long with a 4.5x1.5 cm head) and a silicone brush (19 cm long with a 2.5x1.3 cm head). The second object set consisted of a yellow box (25.6x12.5x9.5) with a hole (1.5x1.2 cm) on top and a plastic toy inside that made a whistling noise when pushed on. The small tool used in the demonstration was a yellow wooden flat stick (14.9 cm long, 1.4 cm wide), while its larger counterpart was 29.7x3.9 cm in size. The alternate tool was a cylindrical stick painted red (14.8 cm, 9mm diameter). The target action entailed inserting the tool in the hole to push on the toy inside the box and to elicit the sound. The last object set constituted of a blue box (10x10x10 cm) with a transparent tube (1.9 cm diameter) attached on top and a small ball inside the tube. The originally presented small tool was a thin wooden stick (14.5 cm long) with wooden balls (1.8 cm diameter) attached on both ends. Its larger counterpart was 25 cm long, while the balls attached were 3.5 cm in diameter. The alternate tool was a stick made out of cork (13 cm long, diameter: 1.5 cm). The target action entailed pushing the ball out of the tube with the help of the tool. For the object sets, see Figure 10.[2]

Procedure

Experiments were conducted by 4 female experimenters of whom 2 took turns in taking the role of Experimenter 1 (E1) and 2 took turns in taking the role of Experimenter 2 (E2); however the roles were counterbalanced across conditions, thus each experimenter participated in both the *Foreign* and the *Native* language conditions.

Upon arrival to the laboratory, children were received by E1, who invited the child to participate in a session of free play in order to familiarize children with the environment and the experimenter. When the child seemed comfortable in the setting, E1 escorted the child and the caregiver into the testing room, where children were seated on

[2]The object sets could be categorized as either completely novel to children (the yellow box with the toy inside and the blue box with the tube on top) or familiar (painting).

the caregivers lap in front of a small table. E1 then told the child that she would be back in a few seconds and left. At this point, a second female experimenter (E2) entered the room and sat down at the opposite end of the table. She started the demonstration by saying three sentences either in Hungarian (participants' native language) or in German (a foreign language to the participants). The sentences were construed in a way that they did not help the interpretation of the object function demonstration, but were not completely unrelated to the context in order to avoid confusing children in the *Native* condition. The sentences could be translated into English as follows: "Where have I put my things? They must be here somewhere. Ah, there they are!". After that, she pulled out the first object set containing the target object and the small tool. She took the tool in her hand, looked at the child with a smile, named the tool by a non-word and demonstrated the action. Then, she put away the object set and repeated the demonstration with the other two object sets one after the other. When the demonstration was over, E2 left the room and E1 re-entered. E2 sat down and said to the child: "Now let's play something, shall we? Let me just see what we have here!" She then pulled out the first object set from behind a panel with two alterations compared to the initial demonstration. The tool used in the first phase was replaced by its larger counterpart that was inappropriately scaled to bring about the same goal. The alternate tool was also presented this time. The two tools were placed on the two sides of the target object. Children were allowed to interact with the object set for as long as they showed interest. After that, E1 put away the object set and presented the next one with the same alterations. Children received the object sets in two pre-defined orders. The order and the side of the tools in the test phase were counterbalanced across conditions.

Figure 10. Object sets used in Study 3. *The upper row represents the target objects and the original tools used in the demonstration. The lower row depicts the two alternative tools used at test.*

Coding

We analyzed children's choices of tools in the first 1.5 minutes of the interaction phase with each object set. Only children's first choices were taken into account and we coded whether it was the over-sized (committing the scale error) or the alternate tool (not committing the scale error). Children not choosing a tool during this time were considered passive on the trial (object set) and the trial was excluded from analyses (*Native*: 2 out of 51 trials; *Foreign*: 6 out of 60 trials). An independent coder blind to the research question coded 80 % of the videos. Reliability between the coders was good (Cohen's kappa: 0.86).

5.2. Results

Statistical analyses were performed with the SPSS 20 software. We used Generalized Linear Mixed Models with binary regression to test for differences in the occurrence of scale errors across conditions. We used backwards modeling, where the

following variables were included in the initial model, but were later removed as they were not significant: sex and age of the child, the presentation order of the object sets, side of the tools used in the test, the identities of the two experimenters, object type (novel/familiar).

Condition had a significant main effect on the amount of scale errors committed by children, with more scale errors occurring in the *Native* as opposed to the *Foreign* condition ($F(1, 101) = 4.024$; $p=0.048$). On average, participants in the *Native* language condition committed the scale error on 48 % of the trials, whereas the rate dropped to 30 % in the *Foreign* language condition (see Figure 11.).

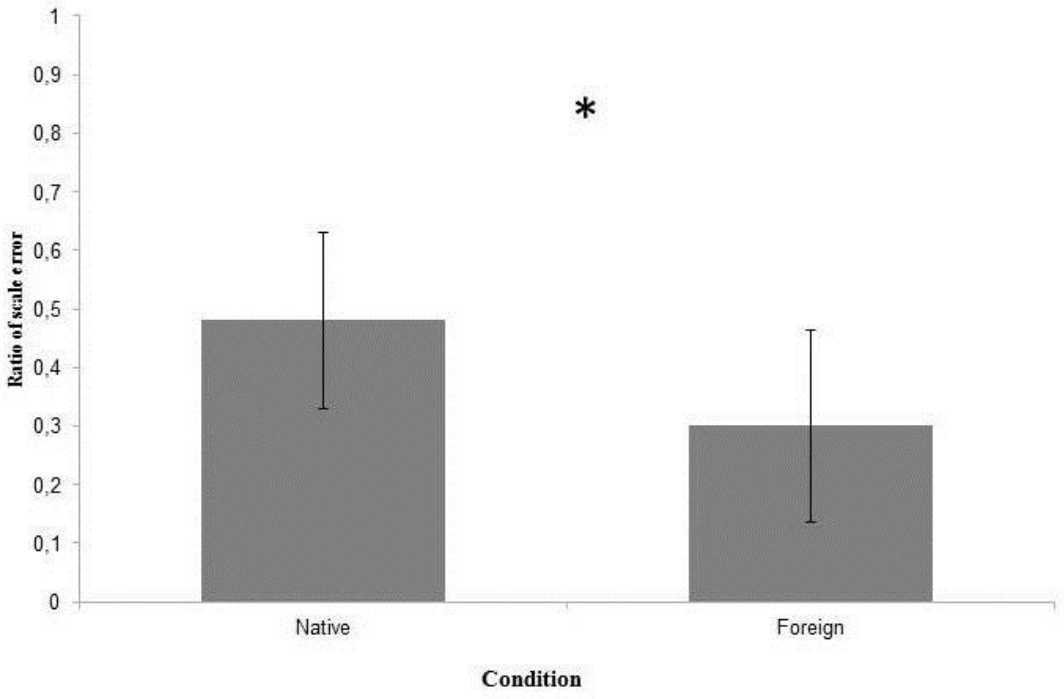

Figure 11. Avarage ratio of committing the scale error in the two conditions.

5.3. Discussion

Building on the phenomenon of scale error, the present study investigated whether 3-year-old children's learning processes about tool functions would be influenced by the group membership of the person introducing the objects to them. We found that children were less prone to committing scale errors if the demonstration was performed by a person speaking in a foreign language. We propose that this result does not merely inform us about a quite specific phenomenon described in the developmental literature –

that is, the occurrence of scale errors – but it reflects the special characteristics of human-specific learning mechanisms and the selection methods in regards to the characteristics of the informants. As described in the introduction, scale errors supposedly occur because children do not treat the artifacts they encounter as individual and unique objects, but form representations of object kinds, during which the function assigned to the category of the artifact becomes a core characteristic (Casler et al., 2011). It has been suggested that a specialized learning mechanism helps children to extract kind-relevant, generalizable information from a single demonstration if the interactional partner expresses their intention of passing on knowledge (Csibra & Gergely, 2009). In this study, children supposedly committed the scale error on nearly half of the trials in the *Native* condition because they regarded the initial demonstration as an instance of teaching. Thus, the above-described genericity-bias (Csibra & Gergely, 2009) led them to retrieve the acquired knowledge (the function of the tool) in the presence of another exemplar of the same category (the over-sized counterpart of the original object) and children tried to enforce that function on the given exemplar irrespective of its actual size.

We propose that the decreased occurrence rate of scale errors in the *Foreign* language condition can be accounted for by the selectivity children exhibit in learning situations. Children's unwillingness to learn from an out-group model led to the elimination of the genericity bias (Csibra & Gergely, 2009), which prompted children to rely more on individual learning (i.e. figuring out the solution to a problem on their own) in the test phase, leading to committing less scale errors.

An alternative explanation for our result could be that children simply paid less attention to the foreign language model and that is why scale errors occurred with less frequency. However, this explanation is not likely, as children were generally equally attentive during the demonstration regardless of condition and they seemed to understand the basic structures of the different tasks (they attempted to achieve the goal that was demonstrated). If children had been simply inattentive in the *Foreign* condition, then we would have expected to see instances where children were simply lost at how to interact with the novel objects. However, this was not the case, children reached for one of the tools on almost all trials in both conditions (see the section on *Coding).*

Altogether, our participants committed more scale errors than children in the study of Casler et al. (2011). While the ratio of scale errors in their study is comparable to that

found in the *Foreign* language condition (around 30 %), this number was substantially higher in the *Native* language condition (48%). This may be accounted for by the fact that children in our study were a few months older than those participating in Casler et al. (2011). Even though the patterns of committing scale errors with respect to age are not consistent across studies, there is evidence suggesting that its occurrence increases from the ages of 2 to 3 years (Ware et al. 2006).[3]

In sum, Study 3 shows how cues of possessing cultural knowledge influences the information children acquire in a social context. When the informant is an in-group member, children not only learn about object affordances but accept the presented object function as the „designed" function and generalize the learned usage of the tool to a kind of objects.

[3]Moreover, we found no statistically significant effect of whether the object set and tools were familiar or novel to the children. Although the rate of scale errors was higher for novel objects (50 % and 44 % in the *Native* and the *Foreign* language condition, respectively) than for the familiar object set (35 % of children in the *Native* condition and 15 % of children in the *Foreign* language condition), we cannot draw valid conclusions from these data due to the unequal number of object sets in the two categories. An interesting question for further studies could be whether children's selective learning from in-group and out-group models would be differentially manifested for familiar and novel objects due to the fact that they already have existing representations of the former. Our date suggest that children are altogether more resistant to committing scale errors when they have previous knowledge, but the effect of demonstration context is possibly stronger in this case. Further data is required to test the validity of the patterns observed here.

6. STUDY 4.

The role of familiarity with a language in children's learning processes from linguistic out-group members

In this study, we aimed to investigate whether epistemic trust can be extended to out-group members through short-term familiarization with a language. This research question has a high practical relevance in modern societies where more and more children grow up in multicultural environments and hearing foreign languages is not uncommon. On the other hand, it is also relevant from an evolutionary perspective as it has been proposed that living in communities where different accents are present has been quite typical throughout evolutionary history (Werker & Byers-Heinlein, 2008), even if it may be markedly different from multiculturalism brought by modern technology. However, as of yet, the role of familiarity with foreign languages – or with social customs from different cultures in general – in children's behavior towards out-group members is not well-understood. A study by Howard, Carrazza and Woodward (2014) has investigated the role of a diverse social environment on children's willingness to acquire knowledge from a person and found that those 19-month-old children that lived in linguistically more diverse neighbourhoods were more willing to copy the behavior of a model speaking in a foreign language. Importantly, this study used a correlational method; therefore we cannot be sure whether other factors besides exposure to the foreign language contribute to this effect.

Cohen and Haun (2013) investigated the role of natural variations in foreign accent exposure on the social preferences of 5-10 year-old children in Brazilian Amazonian towns. These towns differ from one another in the amount of different accents children are naturally exposed to in their environment. They found that older children showed social preferences based on accent (were less likely to cooperate with someone speaking in an unfamiliar accent) but only in towns where they had the chance to hear different accents.

In a study on bilingual children, Souza, Byers-Heinlein and Poulin-Dubois (2013) found that 5-year-old bilingual children were not more likely to prefer out-group members as friends than monolingual children. Importantly, in this study, linguistic group

membership was indicated by accent and foreign accent was always unfamiliar to bilingual children as well.

The present study was designed to provide an experimental test to the question whether familiarity with a foreign language would lead to children becoming more open to informants speaking that foreign language. We also tested whether this possible expansion of trust would generalize to other languages as well.

In the first phase of the experiment, children were either familiarized to a novel language (Czech) or participated in similar sessions in their native language (Hungarian) over the course of four days. On the fifth day, children took part in an imitation task, where an unfamiliar person demonstrated an unusual means to achieve a goal, following which children had the chance to interact with the presented toy. Crucially, before the action demonstration, the model gave evidence of her linguistic group membership by saying a few sentences in one of the following three languages: Czech, Hungarian or Swedish. Based on the type of familiarization and the group membership of the model, we had four conditions: Hungarian familiarization – Hungarian demonstrator/Hungarian familiarization – Czech demonstrator/Czech familiarization – Czech demonstrator/Czech familiarization – Swedish demonstrator.

6.1. Methods

Participants

Participants were recruited from 6 local kindergartens. 65 (31 girls) 4-year-old children participated in the study (range: 43- 52 months, mean: 48 months, SD: 3 months.). All of the children were monolingual Hungarians. Participants were assigned to four conditions based on two factors: the language of the familiarization (native vs. foreign) and the language used at test (familiarized vs novel). Thus, children participated in one of the following four conditions: Hungarian-Hungarian; Hungarian-Czech; Czech-Czech; Czech-Swedish. The distribution of participants in the conditions is depicted on Table 1. An additional 16 children were tested but later excluded from the sample due to passivity in the test phase.

Table 1. Distribution of participants in the different conditions

	Hun/Hun	**Hun/Czech**	**Czech/Czech**	**Czech/Swe**
Number of children (boys/girls)	8/8	9/10	6/9	11/4
Mean age (SD) in months	48.19 (2.92)	47.4 (2.93)	48.88 (2.8)	48.53 (2.36)

Materials

For the imitation task, a round lamp was used that could be lit up by pressing on top (adopted from the methods of Meltzoff [1988] and Gergely, Király & Bekkering [2002]).

For the familiarization phase, children's songs and a cartoon were used. The songs and cartoons were either presented in Hungarian or in Czech. The cartoons were the same ones for both conditions dubbed in the two different languages and a different one was presented to children every day. The songs varied with condition; however they were equated for length. Appendix 2 contains the links to the songs and cartoons used in the familiarization.

Procedure

The familiarization and the testing took place in the kindergartens over the course of a week. Two female experimenters visited the kindergartens every day of the week (excluding the weekend). The first four days constituted the familiarization phase, and testing took place on the fifth. Parents received an informed consent sheet prior to the beginning of the experimental session and only those children were later tested whose parents had given written consent (although all children in the kindergarten groups were present during familiarization). We created two experimental conditions based on the language of familiarization: Hungarian or Czech. Since familiarization was integrated into the daily routines of children, the conditions were defined along the kindergarten groups. Thus, children in one kindergarten group were assigned in the Hungarian

familiarization condition, while children in a second kindergarten group took part in the Czech familiarization.

For the familiarization phase, the two experimenters took part in the daily activities of the kindergarten. During this time, they presented the cartoon to children either in Hungarian or in Czech and lead a short discussion about the story afterwards. The presentation of the songs was distributed in time during the day, such that one occasion happened in the morning and one during the afternoon. The songs were altogether 26 (2x13) minutes long in both conditions. Children were allowed to continue with their regular activities while the songs were playing. The lengths of the cartoons varied between 6:28 and 7:01 minutes per day, thus the total length of the familiarization was 33 minutes on average each day.

Testing took place on the fifth day (Friday) in the form of an imitation task. Children were escorted one by one to the testing area by one of the experimenters they had got to know during familiarization. Children were seated in front of a table where a third experimenter ("model" henceforth) they had not met before was sitting at the opposite side. The lamp for the imitation task had been already placed on the table. The model started the demonstration by saying a few sentences about the kindergarten in one of the following three languages: Hungarian, Czech or Swedish.The content of the short text was as follows: *"Hi! What a nice day we have today! Even the sun came out! I like your kindergarten a lot. The teacher seems very nice too. I bet you like going here as well. Once we are finished with this game, we will take a look around the yard, I am sure there are a lot of nice things there too!"* Children who participated in the Hungarian familiarization heard the model speak either in Hungarian or Czech (*Hungarian/Hungarian* and *Hungarian/Czech* conditions), whereas for children participating in the Czech familiarization, the model spoke either in Czech or Swedish (*Czech/Czech* and *Czech/Swedish* conditions). Thus, in both cases, the testing language was either same as the one used during familiarization or was a novel language to children (see Figure 12.). The *Czech/Czech* condition was introduced to test for the effect of short-term familiarization on children's trust toward out-group members, whereas the *Czech/Swedish* condition was designed to explore whether any potential familiarity effect was specific to the familiar language or whether familiarity with one language would lead children to extend acceptance to linguistic out-groups in general. The model was monolingual Hungarian; however she was trained by native speakers of Czech and

Swedish prior to the experiment in order for her to mimic the specific accents as much as possible.

Immediately after the demonstration of linguistic group membership, the model performed the target action three times: bending forward and switching on the lamp using her forehead. After that, one of the experimenters took the lamp, gave it to the participant and said: "It's your turn now". Children were allowed to interact with the lamp as long as they showed interest.

Figure 12. Experimental design of Study 4.

Coding

Children's behavior was coded from the videos recorded during the test phase. In studies using the head-touch task, the main focus of analysis is usually whether children perform the head-touch action in the first one-minute period of the testing phase (see Gergely et al., 2002). This is partly due to the fact that first responses do not show variability with young children: they almost uniformly use their hands first and may or may not perform the head-action afterwards. However, since our – considerably older – participants did not show this pattern, we chose to code the first responses of children. Participants who refrained from interacting with the lamp in any way were considered passive and were therefore excluded from analyses. A second coder blind to the research question coded 42 % of the sample. Inter-rater reliability was excellent (Cohen's kappa: 0.931).

6.2. Results

Analyses were conducted using Loglinear analyses with three categorical variables. The dependent variable was whether children performed the hand or the head action as their first response. Two independent variables were defined: the first, whether the language of the familiarization was children's native language or a foreign language and 2, whether the language at test was the same as the one they were familiarized to (either Hungarian or Czech) or was a novel language (Czech for the children familiarized with Hungarian and Swedish for Czech familiarization group). Thus, we applied a 2x2x2 loglinear analyses.

We found a significant three-way interaction of the factors ($G^2(4)=14.24$; $p=0.007$) and a significant interaction between response and whether the language at familiarization and at test matched ($G^2(2)=13.48$; $p=0.001$), showing that children were likely to reproduce the head action when the model spoke the language they had been familiarized to (see Figure 13). The language of the familiarization in itself had no effect on responses ($G^2(2)=1.56$; $p=0.458$). Note: values presented here represent interactions of the factors when the effect of the third factor is removed.

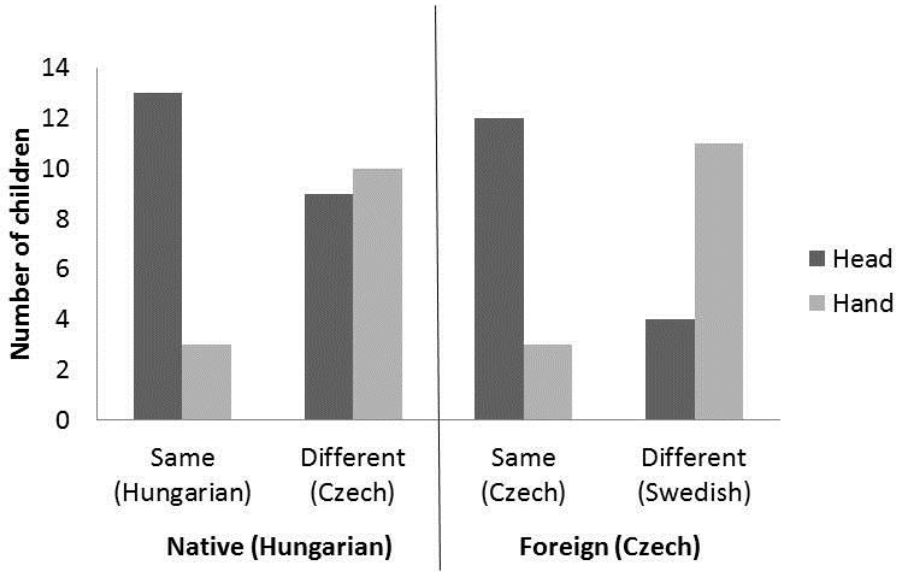

Figure 13. Occurrence of response types (head-touch vs. hand) in the different conditions in Study 4.

6.3. Control condition

The above results provide interesting insight into how children extend trust to speakers of a non-native language (see the Discussion below); however, we found one peculiarity in the pattern of results that we wanted to look into before evaluating the results. That is the relatively high rate of imitation in the *Hungarian/Czech* condition. Although our main variable of interest (same or different language at test and familiarization) was significant, showing that short-term familiarization can increase imitation rates, we judged children's performance in this condition to merit further investigation. Since in similar studies (e.g. Buttelmann et al., 2013; Howard et al., 2015), imitation rates of an out-group model are lower than what we obtained here, we posed the question of what might make the difference. Given that our manipulation was the 4-day-long familiarization phase (in this case, in children's native language), we hypothesized that this may be behind children's elevated willingness to endorse the information coming from the out-group model. One possible explanation for that would be that the familiarity

with the experimenters created by the week spent together before testing would evoke stronger trust in them than the level of trust in similar studies where children only meet the experimenters immediately before testing. This trust would have a carry-over effect to the linguistic out-group model that accompanied the experimenters on the last day. However, this elevated level of trust could potentially be weakened in the case where the familiarization itself was carried out in a foreign language. To test this hypothesis, we ran a condition where Czech language was used at test, but testing was not preceded by a week of familiarization.

Participants

16 4-year-old children (9 girls) took part in the control condition of the experiment (Mean: 48.25 months, SD: 3.53 months, range: 44-54 months).

6.4. Results and discussion of the control condition

Results seem to support our hypothesis, showing that only 6 out of 16 children imitated the unusual head-action in this condition. Although this pattern is not significantly different from children's performance in the familiarized *Hungarian/Czech* condition ($\chi^2(1)=0.345$; $p=0.557$), the 37.5% imitation rate is comparable to results obtained in other studies on imitation of out-group models (e.g. Howard et al., 2015; although note that methods and age groups differ along studies). Thus, these results seem to provide some support for the idea that it was the familiarization process itself that lead children to copy the behavior of the Czech speaking model more than what the typical findings in the literature would predict.

6.5. Discussion

In this study, we investigated whether children would extend their epistemic trust beyond native speakers to speakers of a foreign language that they have been familiarized to. Children received familiarization over the course of four days in the form of songs and cartoons and were tested with the head-touch task on the fifth day. We found that

children's tendency to imitate did not depend solely on the language of the familiarization but on whether the language at test and at familiarization were the same. Thus, regardless of whether the familiarization happened in a foreign language, their willingness to learn from the model increased when she spoke that particular language. Interestingly, this increase resulted in performance that matches children's behavior when they were presented with a model speaking their own native language. Moreover, children were reluctant to imitate the model when they were familiarized with a foreign language and the model spoke in *another* foreign language. This shows that despite children's openness to extend their trust, this is limited to the circle of people speaking the language that has already been introduced.

These results are somewhat at odds with Howard et al. (2014) who found that children living in diverse social environments are more likely to endorse information coming from a linguistic out-group model, but this is not driven by exposure to the language used at testing but by diversity in the environment in general. However, it is important to note that this study used a correlational method and re-analyzed data from previous studies originally designed to test other aspects of learning from linguistic out-group models, whereas our study applied direct manipulation of language exposure. Moreover, the definition of the independent variable may also make a difference: their study looked at neighbourhood diversity whereas our familiarization involved presenting children with songs and cartoons. Importantly, in our study the foreign language was always introduced by speakers of their native language and the kindergarten teachers (that are part of children's everyday life and possibly represent trustworthy information sources) were also involved in the familiarization process. In the study by Howard et al. (2014), linguistic diversity was defined both by exposure in the form of media content, visitors and generally the characteristics of the neighbourhood of their residence. The last factor differs from the previous ones in that the former two are supposedly occassions where the speakers of the foreign language are looked at with a friendly eye by family members and are very likely introduced by them (similarly as in our study), however, this may not be true when evaluating mere neighbourhood diversity. First, because children may not necessarily have direct contact with those in their physical environment that speak a different language and second, the attitude of the parents may be more mixed towards these people. Potential negative attitudes can actually have the opposite effect as watching TV in a foreign language or meeting house guests toward Spanish speakers and

these two contradictory effects could lead to a null-result when analyzing the effects of exposure to Spanish in general.

Note that there was also a considerable age difference between the two studies: while the mean age of participants in the Howard et al. study was 19 months, we were testing 4-year-olds. The reason for our choice was the fact that selectivity based on language is more robustly demonstrated above the age of 3, especially when live demonstration is used (see Howard et al., 2015). Thus, we cannot exclude the possibility that the not perfectly convergent results are at least partly due to the age difference.

Our results are more in line with the studies on bilingual children (Souza et al., 2013), showing that despite being brought up with the idea that people may not speak the same language, children show a strong preference based on the linguistic group membership of the other person – thus their acceptence of diverse languages is limited to the languages with which they are already familiar.

A somewhat surprising result obtained in our study is that children in the Hungarian familiarization – Czech testing group showed higher level of imitation than those in the Swedish group or compared to other studies (e.g. Buttelmann et al., 2013; Howard et al., 2015), although this difference was not significant. One possible explanation concerns the familiarization process. Children may have had an increased willingness to imitate the Czech speaking model because the experimenters had become more familiar to them in the previous four days than usual in experiments. Since the testing situation was coordinated by them, it could have affected children's trust in the model that appeared in their company. This effect may have been weaker in the Swedish condition because the language of the familiarization was Czech which could have made the experimenters a little more controversial. Our results obtained in the control condition lend support to this idea.

The most interesting question regarding the results is why and under what circumstances can epistemic trust be extended in such a manner? We propose that the mechanism at play here is social learning itself: children were more willing to accept the speaker of the familiarized language because the language was introduced by people that were deemed trustworthy from the beginning (because they were linguistic in-groups and because the kindergarten teachers were collaborating with them). Thus, throughout the familiarization period, children endorsed the novel language much like any piece of novel

information presented by a reliable teacher. Consequently, when they met someone on the last day that spoke to them in that language, they took the linguistic cues as indication that the person is also familiar with the ways of their own group (group either defined as the sub-culture of the kindergarten group or even more broadly) and concluded that they can trust the information coming from that person. This reasoning can be also consolidated with the discrepant results between this study and that of Howard et al. (2014). In that study, exposure to Spanish failed to alone predict acceptence of the linguistic out-group as a model, potentially because due to the methodological reasons, this kind of social learning effect was not present.

We propose that our results provide insight into how children enrich cultural knowledge and how they slowly extend the circle of potentially reliably teachers through perceived familiarity with certain characteristics of an already trustworthy person. Previous studies, for example on race (Kinzler & Spelke, 2011; Krieger et al., 2016), suggest that not every characteristic is equally a good candidate to form the basis of comparison with the person of trust. Our proposal is that children select those cues that signal shared knowledge (whether the person can be regarded knowledgeable or not), which is why these effects are more robust with linguistic cues (e.g. Buttelmann et al., 2013; Howard et al., 2015, but see also Study 3) and work with other cues of knowledgeability (Poulin-Dubois et al., 2011., Brosseau-Liard & Poulin-Dubois, 2014; Zmyj et al., 2010; see also Study 2).

To test the idea that it is not mere familiarity driving the effects demonstrated in this study, we are currently working on a protocol where the novel language is presented in a non-social context. The lack of familiarization effect in that study would provide that social learning mechanisms drive the extension of epistemic trust.

7. STUDY 5.

Shared cultural knowledge in adults' social categorization processes

The studies presented so far have all focused on children's social categorization processes and how it guides learning. Investigating children's social category representations provide a unique insight into the nature and function of social categorization since in their case; we may tackle the phenomenon before it becomes saturated with socialized effects. However, if certain cues of group membership have primacy in guiding children's behavior toward other people because they foster success in group living (and are possibly evolutionary adaptations), then despite all the conditioned and socially acquired stereotypes existing in the adult brain, some relevance of these cues could be observed in adults as well.

Even though one of the most prominent features of human social categorization processes is the tendency to form group affiliations based on any trivial or indicidental cue (Tajfel et el., 1971), it has been suggested that there may be a number of dimensions that enjoy primacy in the hierarchy of cues (e.g. Kinzler et al., 2010; Kurzban et al., 2001). This may be due to conditioned effects, through which certain perceptual or otherwise salient cues get associated with the primary signal of group membership (Kurzban et al., 2001; Pietraszewski & Schwartz, 2014a) and/or because the dinamics of human social interactions require flexibility of the system and as a by-product, distinctions that may not carry meaningful information will also be utilized.

Kurzban and colleagues (2001; see also Cosmides et al., 2003) have proposed that the evolved system that plays a crucial role in social categorization is a coalition detection device that helps keeping track of the constantly changing alliances that humans form for different purposes. They argue that other cues, such as race seem to work as a primary cue because due to historic reasons, it has had high correlation with coalitions and direct cues of coalitional affiliations may on occasions be less available. Their hypothesis was that in the presence of direct cues of coalitional allegiances, secondary cues, such as race, will not be encoded or its relevance will be reduced. To test this idea, they used a modified version of the memory confusion paradigm (Taylor, Fiske, Etcoff & Ruderman, 1978). In the classic version of the paradigm, participant view a discourse between people

who can be categorized as members of two different social groups along one fundamental social category (in the original study of Taylor et al.: racial or gender groups). Each person has a number of distinct utterances and following the presentation of the discourse, participants' task is to match the utterances to the speakers. Researchers make inferences about social category representations based on the mistakes participants make during the matching task. The idea is that if people categorize others along a certain dimension, they will make more errors where they mistakenly attribute an utterance to a person who belongs to the same category as the person who actually uttered the sentence. Taylor et al., (1978) have shown with this method that people automatically encode race when encountering people, even if they are not explicitly instructed to pay attention to this quality of the speakers and they may not even be aware of how the social category representation influences their memory for the observed discussion.

Kurzban and colleagues (2001) used the same method to demonstrate that race encoding is neither inevitable, nor automatic, but simply a by-product of coalitional psychology. In their version of the task, the utterances of the protagonists appearing in the demonstration were created in a way that suggested two coalitional groups among them. Importantly, half of the protagonists were European Americans, while the other half were African Americans; however the coalitional groups were racially mixed. Under these circumstances, participants categorized the protagonists along both dimensions (race and coalition), but the strength of racial categorization was reduced and it could be even eliminated when coalition information was correlated with another type of perceptual cue. Moreover, the same effect could not be replicated when the second category dimension (next to coalition) was not race, but sex. This suggests that the human mind is more adept at encoding certain qualities of people, such as allegiances or sex than about race.

Using the same paradigm, a handful of studies have highlighted other dominant dimensions of social categorization, such as language (Pietraszewski & Schwartz, 2014a; Pietraszewski & Schwartz, 2014b) and kinship (Lieberman, Oum & Kurzban,2008).

In the present study, we aimed to test whether sharing cultural knowledge with oneself would also be encoded in an automatic manner. Following the logic of previous studies with the same paradigm, we pitted cues of sharing knowledge against race (Experiment 1) and tested categorization by shared knowledge without any competing dimension (Experiment 2).

Hypotheses:

1, Group membership based on cues of sharing cultural knowledge will be encoded by participants.

2, Since race has been repeatedly shown to lose its significance in the face of other socially relevant information about a person, the same reduction effect could be observable when racial groups are cross-cut by groups defined by their shared knowledge of cultural information.

7.1. Experiment 1

7.1.1. Methods

Participants

49 adults between the ages of 18 and 35 (mean: 22.8 years, SD: 4.5 years; female: 26 db) took part in the study.

Stimulus

For the stimulus, photographs of six males and six females were selected from the Facity database (facitiy.org). In order to avoid the confounding effect of another category (sex) separate stimulus sets were created from the female and the male faces. Importantly, out of the six faces of each sex, three depicted Caucasian individuals and three depicted people of colour. The group membership based on shared cultural knowledge was indicated by the content of the utterances. We used individual utterances (as opposed to parts of a discussion) that related to eating habits. Altogether, 42 utterances were used, out of which 12 were statements indicated adherence to the cultural norms of the participants' native country (Hungary) or knowledge of trivia related to the Hungarian culture (e.g. "When friends come over for dinner, I often welcome them with a glass of palinka"/In Hungarian: "Ha vacsorára hívom a barátaim, gyakran pálinkával üdvözlöm őket"/ or "Chicken paprikasch is one of our traditional dishes" / In Hungarian: "Egyik

hagyományos ételünk a paprikás csirke”/). These sentences are henceforth referred to as “in-group sentences”. Another 12 utterances described habits or knowledge that were unfamiliar to participants (“out-group sentences”, e.g. “When we have guests over for dinner, the wife and the husband cannot sit next to each other”/In Hungarian: “Ha vendégek jönnek vacsorára, a férj és a feleség nem ülhet egymás mellé.”/). Furthermore, the remaining 18 sentences were neutral in the sense that they contained no cue about the cultural group membership of the participant, but were still associated with the topic of eating (e.g. “I tend to get sleepy after a meal” /In Hungarian: “Evés után gyakran elálmosodom”/). These sentences are referred to as “test sentences” in the following parts of the description. For a full list of the utterances, see Appendix 3. Each face was allocated 7 utterances by a computer program (for details see the Procedure section) in a way that a photo was either paired with four of the “in-group” sentences or four of the “out-group” sentences and three of the test sentences.

Figure 14. Faces used for the female race vs. cultural knowledge version of the paradigm.

Procedure

Participants were tested in various locations, but always in a quiet room where no one else was present but the experimenter and the participant. Tests were conducted by three different experimenters (two females and one male). Upon arrival to the laboratory, participants were informed that they would be taking part in a study exploring certain aspects of memory related to social stimuli and their task was briefly explained to them. They were informed that they would hear statements about eating habits that come from six different individuals and that while they listen to the statement they will see the person who made the given statement. They were not given any information about the subsequent task, but were simply instructed to pay close attention.

The stimulus was presented on a 14" laptop with the help of PsychoPy software (version 1.83.01). The software assigned half of the faces to be "cultural in-groups" and the other half to be "cultural out-groups" randomly with the following constraint: the groups had to be racially mixed, and for half of the participants, the in-group team consisted of two Caucasian faces and one face of a person of colour, while for the other half, the pattern was reversed (one Caucasian face in the "in-group" team).

During the presentation of the stimulus, the photographs appeared on the screen one by one while an utterance was heard from the speakers. Each face appeared seven times, presenting the seven statements assigned to the face. The first part of the presentation constituted the induction phase, where only statements indicating group membership were presented (3 for each face). The second phase constituted the test phase, where faces were paired with the neutral (test) sentences. The remaining "in-group" and "out-group" sentences (1 for each face) were inserted into the test phase, as a reminder of group membership. The induction and the test phases were not ostensibly separated for participants and their attention was not brought to the distinction between the statements. Apart from the limitations mentioned above, the software randomized the presentation order of the statements and the statement-face pairings. The voices belonging to each face was also randomized across participants.

After the presentation, participants received a sheet on which the six faces could be seen and the faces were numbered. They were told that now their task would be to match the sentences to the faces. They were told that they should give an answer even if they are not certain they have the correct answer. After that, the sentences appeared one

by one on the screen and participants were required to indicate which face it belonged to by pressing a number key from 1-6.

Data analyes

To assess categorization processes, we analyzed the incorrect answers of participants. Specifically, we analyzed whether participants would make more within group errors (mistakenly attributing a statement to another person belonging to the same social group) than between-groups errors (mistakenly attributing a statement to a person belonging to the other social group). We conducted separate analyses for the two social categories contrasted in the experiment (cultural group membership and racial group membership). For both types of social category distinctions, we had two analyses. The first one only focused on the test sentences. This provided the stronger test, since in this case, there were no remembrance cues available for participants when matching the sentences to the faces. The content of the statement was not informative regarding cultural habits and there were no perceptual correlates of cultural group membership either that could help participants make the decision. The second – weaker – analyses included all of the statements used in the experiment. In this case, for 18 of the sentences, the content of the statement contained direct cues to cultural group membership, thus even is participants were not absolutely sure about the correct answer, they could have used an overt strategy to choose randomly between the three faces that had been paired with sentences with similar content. This would increase the likelihood of committing withing group errors, but only if the category representation of cultural groups have been formed during the demonstration. To assess the number of within-group errors, we simply counted the number of times participants committed this kind of error. However, for between-group errors, the sum of erroneous choices was multiplied by 2/3 to correct for the factor that the chance of committing a between-groups error was higher. This is because in the case of within-group errors, there were only two potential incorrect answers as the third option was the correct answer itself.

Analyses were performed in the SPSS 20.0 software. In all cases, we conducted paired-sampled t-tests with number of errors as the dependent and error type as the main independent variable.

7.1.2. Results

Social categorization by race

Social categorization by race on the test sentences

On average, participants committed 5.3 (SD:1.93) within-group (WG) errors and 4.64 (SD: 1.49) between-groups (BG) errors. The difference was marginally significant ($t(48)=-1.792$; $p=0.079$).

Social categorization by race on all of the sentences

The analyses yielded no significant differences between WG (M: 11.98; SD: 3.91) and BG (M: 10.98; SD: 3.54) errors when all of the sentences were included ($t(48)= -1.251$; $p=0.217$).

The results of the analyses on racial categorization are depicted on Figure 15.

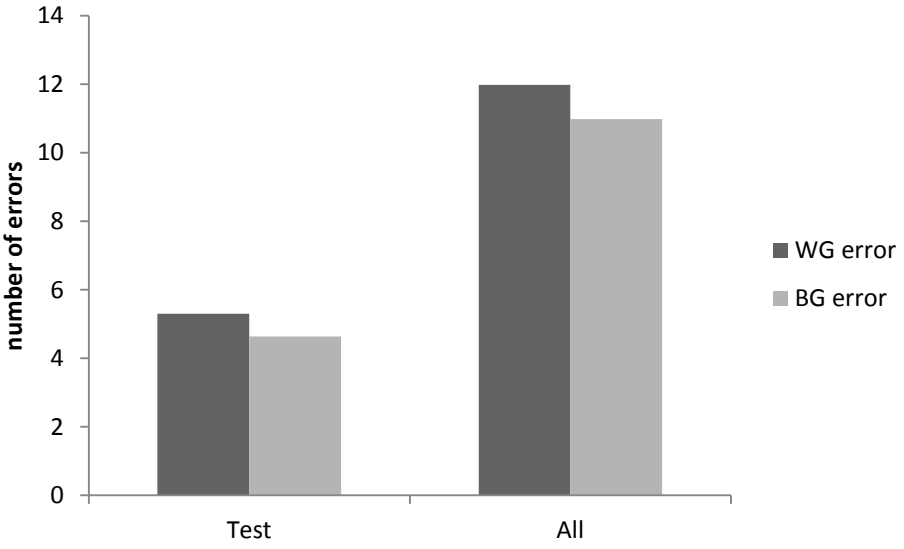

Figure 15. Average number of errors committed for race as a dimension of social categorization.

Social categorization by shared knowledge

Social categorization by shared knowledge based on the test sentences

Participants did not commit more WG errors (M: 4.78; SD: 1.97) than BG (M: 4.99; SD: 1.69) errors when matching the test sentences to the faces ($t(48)=0.518$; $p=0.607$).

Social categorization by shared knowledge based on all of the sentences

Results show that participants committed significantly more WG errors (M: 12.74; SD: 3.96) than BG errors (M: 10.48; SD: 4.5) when the induction sentences were also included ($t(48)=-2.206$; $p=0.032$).

The results of the analyses on categorization by shared knowledge are depicted on Figure 16.

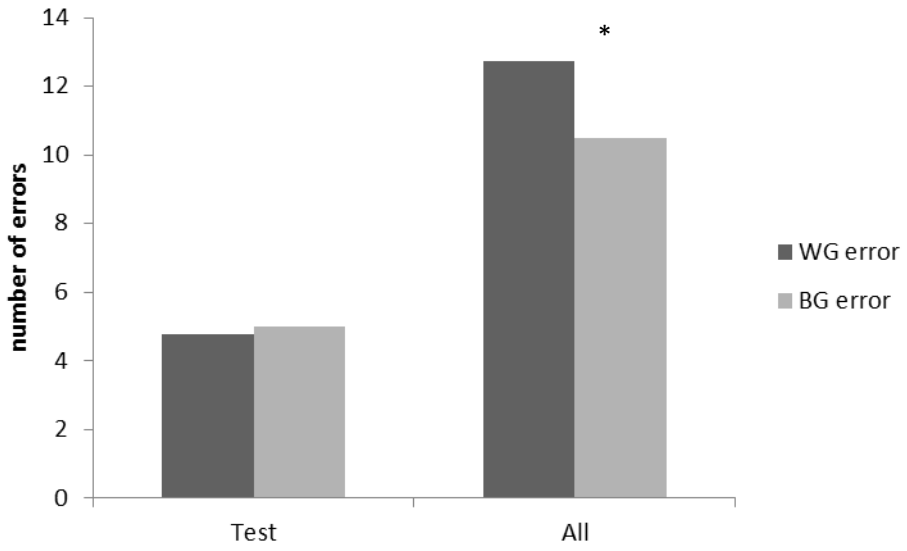

Figure 16. Average number of errors committed for shared cultural knowledge as a dimension of social categorization.

7.1.3. Discussion of Experiment 1

This study tested whether social categorization by shared cultural knowledge would be manifested in adults using the memory confusion paradigm. Following the methods of Kurzban et al. (2001), we contrasted cues of sharing cultural knowledge with another quality that has been traditionally viewed as a primary dimension of social categorization: race. We hypothesized that categorization both by race and shared cultural knowledge would be manifested and that potentially, the effect of racial categorization would be smaller than that of shared knowledge. The results do not fully support these hypotheses. First, we found no clear evidence of categorization by race. When the analysis was restricted to the test sentences, where the content of the statements provided no cue to cultural group membership, the index of racial categorization just fell short of reaching significance, showing only a marginal effect. This marginal effect disappeared when the induction sentences were also included in the analyses. Regarding categorization by shared knowledge, we found a significant effect but only when both the induction sentences and the neutral sentences were included in the analyses.

The fact that categorization by shared knowledge was demonstrated on all of the sentences shows that participants have formed representations about group membership based on cultural knowledge, however these representations were not strong enough to guide information processing when direct cues of group membership were no longer available but another (conflicting) perceptual cue was present. Importantly, we did find modulatory effects of adding information about knowledgeability of cultural practices on the perception of racial categories. In the case of the test sentences, the index of racial categorization did not reach significance, even though in similar studies, the effect has been proved quite robust in other studies (e.g. Taylor et al., 1978, Stangor, Lynch, Duan & Glas; 1992; Maddox & Chase, 2004).Thus, we suggest that this reduction is due to the fact that the other dimension of social categorization could not be suppressed and was interfering with information processing. This shows that category representations based on shared cultural knowledge was competing with racial category representations in organizing the incoming information.

Note that while cues of racial category were continuously present both in the demonstration phase and in the test phase, this was not true for cultural categories. In the second part of the demonstration phase where the test sentences were presented, for

participants to use cultural group membership as an anchor for organizing the stimulus, participants would have had to rely on memory. Similarly, in the test phase, no perceptual cues highlighted cultural group membership, but racial group membership was apparent. Thus, social category representations based on shared cultural knowledge would have had to be significantly stronger to elicit the expected effect on the test sentences alone. In the study of Kurzban et al. (2001), categorization based on coalitional relations were found both when no perceptual cues marked category boundaries and when such cues were added, however, the latter also resulted in significantly diminishing the effect of race. It is possible that encoding coalitions is a more fundamental feature of the human mind than encoding whether there is a shared representational space with another partner, however, the results may also stem from methodological differences.

There was at least one important difference between the structures of the two experiments. Namely, while in the study of Kurzban et al. (2001), the coalitions created did not have any self-relevance (it depicted two unfamiliar sports teams), the groupings based on shared knowledge in our study inevitably lead to self-categorization as well (Turner et al., 1987). The fact that both category dimensions could elicit placing oneself in the representational field could potentially attenuate the effect through learned associations between the different dimensions. That is, in Hungary, blacks do not comprise a numerous ethnic group, therefore learned associations may foster the inference that skin colour is also indicative of knowledgeability of Hungarian culture. Thus, when watching a cultural in-group, black face, it could elicit a slight confusion as – for historic reason – skin colour could be seen as a predictor of whether someone is likely Hungarian or not. This could potentially weaken the effect. This effect would be weaker in the study of Kurzban et al. because 1, differences in the racial composition of the Hungarian and the American (California) society may elicit less strong predictions about nationality from skin colour in the US. 2, categorization by coalitions related to sports may be less sensitive to learned skin colour – nationality associations.[4]

To further clarify whether participants encode social categories based on shared knowledge, in Experiment 2, we removed the competing social category distinction. The faces used in this version of the task did not differ along any of the social dimensions

[4] One possibility to address this problem would be to test a more salient minority in Hungary, gypsies.

classified traditionally as “basic” (sex, age, race – see for example, Fiske, 2000). However, the content of the statements still provided information about the person’s familiarity with and adherence to cultural practices.

7.2. Experiment 2

7.2.1. Methods

Participants

31 adults participated in the study between the ages of 19 and 43 (mean: 25.39; SD: 5.83; 15 females).

Materials

The stimulus used in the experiment was in most part identical to that used in Experiment 1 with the modification that all protagonists were Caucasian. Again, two different stimulus sets were created: one containing female (see Figure 17.) and one containing male (see Appendix 5.) faces.

Figure 17. Faces used for the stimulus including females

Procedure

Testing was carried out by two female experimenters at various locations, but on all occasions in a quiet room where no-one was present but the participant and the experimenter. Besides the identity of the experimenters, all other aspects of the procedure were the same as in Experiment 1. Half of the participants received the male and half received the female version (with the sex of the participant counterbalanced across these two conditions).

Data analyses

Data analyses followed the methods of Experiment 1. Thus, we calculated the indices of social categorization (between-groups and within-group errors) separately for the test sentences only and all of the sentences, but in this case, only based on the

dimension of shared cultural knowledge. For statistical analyses, paired samples t-tests were conducted.

7.2.2. Results

Analyses performed on the test sentences only

The analysis yielded no significant difference between WG (M=4.45; SD=1.95) and BG (M: 4.28; SD: 1.58) errors when only the test sentences were included ($t(31)=0.372$; $p=0.712$).

Analayses performed on all of the sentences

When including all the sentences in the analysis, we found that participants made significantly more WG (M: 13.26; SD: 3.78) than BG (M: 7.83; SD: 2.87) errors ($t(31)=6.471$; $p<0.001$), suggesting that category representations have been formed.

The results are depicted on Figure 18.

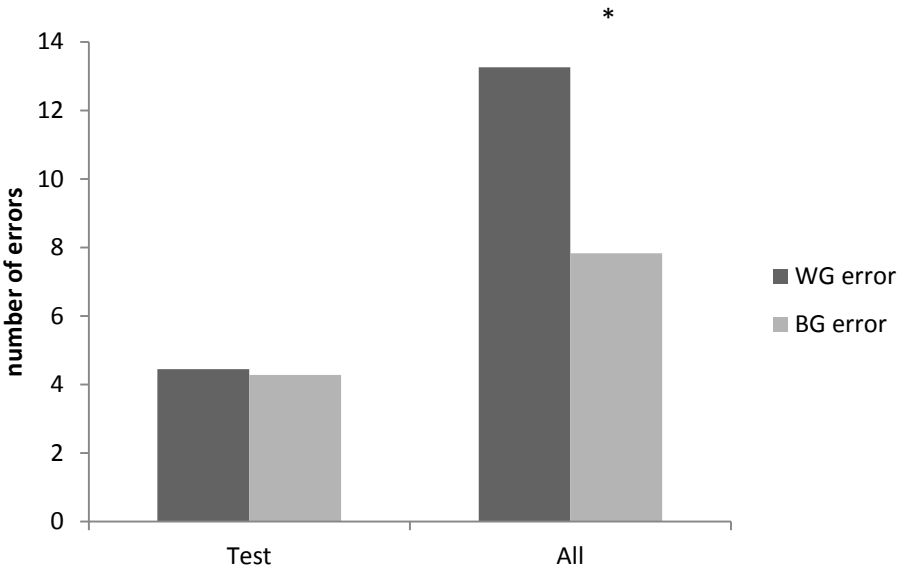

Figure 18. Average number of errors by type calculated for the test sentences and all the sentences.

7.2.3. Discussion of Experiment 2

In experiment 2, we tested categorization based on shared knowledge without any potentially interfering other category dimensions. The results show that category representations based on shared cultural knowledge have been formed; however, when no direct cues to cultural group membership were available, the representations were not strong enough to effectively organize information relating to the person. This is shown by the fact that when analyzing all of the statements used in the experiment, we found evidence of categorization by shared knowledge, but this effect was not present when the statements provided no direct cue cultural group membership.

Similarly to Experiment 1, where cues of shared knowledge were contrasted with race, the lack of significant effects on the test statements may result from the fact that for cultural group membership there were no perceptual cues available to help encoding, however it is also a possibility that such cues are not seen as equally important as race or sex, for example (see Taylor et al., 1978). Although no follow-up questions were asked about the strategies participants used in answering the questions, we can speculate that they may have explicitly classified half of the participants as "cultural in-group" and the other half as "cultural out-group". Since the expected pattern of errors was quite pronounced on all of the sentences (despite the fact that it also contained the test sentences that do not show this pattern), it is reasonable to assume that once participants were presented with a sentence that they did not remember but that could be classified as "in-group", they simply had to retrieve the three faces that belonged to the "cultural in-group" category and make a guess based on that. This strategy requires only that they form the impression about cultural knowledgeability (and form category representations based on it) by the end of the demonstration, but it does not necessarily require using this piece of information while watching the demonstration. This, however, does not work equally well with racial distinctions as the sentence itself does not contain any cue about race, thus, such an explicit strategy only works if participants consciously use race as a distinction at encoding from the beginning ("I remember this was said by a white person").

The fact that evidence of categorization was only apparent when the sentences at recall were relevant for shared knowledge is in line with the results of Pietraszewski and

colleagues (2014) who have obtained similar results using non-antagonistic coalition groups.

7.3. Conclusions of Study 5

The present study provided evidence that adults do encode social categories defined by shared cultural knowledge. Even though participants' attention was not a priori brought to the fact that there might be a cultural gap between the individuals in the demonstration, the results show that they used this piece of information when making post-hoc judgments about sentences. We could also show that this could override categorization by race – a perceptually salient cue. Thus, the tendency to map out social groups that are defined by a set of shared knowledge persists into adulthood as well.

8. GENERAL DISCUSSION

In this dissertation, my aim was to describe a new perspective on the function of social categorization and introduce a dimension of social categorization that may constitute a fundamental distinction for the human mind. One of the distinctive features of human sociality is that we form groups that constitute a stable frame for interactions over generations. What is more, in many respects the key to our survival is provided by the wider social environment we belong to (Henrich & McElreatch, 2003). Human societies are also special in that we easily form sub-groups for the different purposes and can represent multiple overlapping social categories. Moreover, we can switch between sub-groups with relative ease. For example, at one point our professional affiliation is highlighted when interacting with colleagues, yet at another time point, we can also comfortably interact with our family members. Thus, differentiating between social environments is a pivotal ability even within one society.

Our proposition is that the crucial element in representing fellow humans as belonging to certain groups or categories is understanding the behavioral norms and cultural knowledge that guide behavior and that makes it possible to successfully interact with each other. Shared cultural knowledge makes it possible to rely on institutions that increase our chances for survival (e.g. health-care or using money to exchange goods) and also makes interpersonal interactions more efficient (see also the section on "Theory of mind and social categorization"). For example, the assumption that the other person speaks the same language makes it possible to interact with the person without putting too much effort into trying to map out their competences. Similarly, understanding the boundaries of shared knowledge makes it easy to adjust our behavior in different social environments. For example, we have no difficulty in finding the appropriate way to communicate with our colleagues and our family members, during which the behavioral rules and even language use may be significantly different (it is not simply a matter of appropriateness, but communication could potentially be severely impeded by using the same terminology or relying on the same references at home as we do in the work place). However, for all of this to work efficiently, adapted social learning mechanisms should ensure that shared knowledge is preserved over time and that learners 1, assume that the obtained knowledge is indeed shared by others; 2, assume that validity of the knowledge is nonetheless restricted.

The prediction we formed based on these idea is that the human mind will be especially sensitive to cues that are direct indications of whether knowledge bases match between individuals. As described above, understanding the boundaries of social groups defined by a certain set of cultural knowledge and practices guides behavior in at least two important ways. First, it helps us define the limits of the validity of certain behavior patterns and ideas and thus helps us adjust our behavior in order to interact adequately with others. And second, this – in evoluationary terms – will favor selective learning processes that ensure that one will be in possession of relevant cultural knowledge. This is most easily achieved by selectively endorsing information provided my members of the given social group. Thus, our proposition is that identifying in-group members have a special significance for children, namely to guide learning processes by singling out culturally knowledgeable individuals.

The studies presented in this dissertation addressed two hypotheses derived from this theory. First, that the human mind has a faculty that is specialized for detecting the boundaries of cultural knowledge. This faculty should be sensitive to cues that reliably signal whether another person shares cultural knowledge with oneself. In our view, language proves to be such a strong cue for social categorization (e.g. Kinzler et al., 2007; Kinzler et al., 2009; Kinzler et al., 2011; Pietraszewski & Schwartz, 2014a; Pietrszewski & Schwartz, 2014b) because it is a part of shared cultural knowledge and people speaking the same language with the same accent generally share other aspects of cultural knowledge and are more likely to engage in cooperation (either face to face or through cultural institutions) than people speaking different languages.[5] However, there may be other cues that serve as an input for social categorization by cultural knowledge. In the presented studies, we proposed that tool-using behavior may be an adequate signal as 1, tool-using habits are inherently cultural; 2, children rapidly learn about object functions and from an early age treat information about functions acquired in a social context as fixed (Casler & Kelemen, 2007).

Study 1 was designed to address the question whether tool-use and language-use are represented in a coherent manner. Our hypothesis was that if children treat both types of behavior as a manifestation of shared knowledge then they would form some kind of

[5] Of course, language has other characteristics that makes it an especially efficient cue. As a primary means of communication for humans, infants rapidly learn

connection between these two facets of behavior. The study provided evidence that violations of the social conventions in using familiar tools are associated with unfamiliar language use in the representations of 2-year-old children.

Next, in Study 2, our aim was to test whether children would show similar selectivity in their learning processes based on tool-use as language-use. In this study, we also added another variable that has a defining role in cultural-learning: the ostensiveness of the context. Our results showed strong selectivity based on the tool-using habits of the model, but this effect was not modulated by whether the demonstration was communicative or not. This implies that 3-year-old children first identify the circle of potential teachers and are unwilling to learn from someone outside this circle even if the person expresses their willingness to pass on information.

Study 3 was designed to investigate the mechanisms through which cultural knowledge is transmitted. Building on the phenomenon of scale error, we showed that 3-year-old children treat artifact functions as culturally fixed only when the initial demonstration of the function was presented by a linguistic in-group. Thus, the linguistic group membership of a person defines their competence regarding other cultural phenomena, such as tool-functions. These results also fit well with the genericity bias described in the theory of Natural Pedagogy (Csibra & Gergely, 2006; 2009): when information is presented by a cultural in-group member, children apply the expectation that the information is not restricted to one exampler but to other tools that are perceived to be of the same kind.

Study 4 explored the question of how the epistemic trust formed on the basis of cues implying shared culture (in this particular study, language) are extended. Here we showed that even short-term familiarity with a language evokes epistemic trust in a person speaking that language (but not other foreign languages). We propose that this extension of trust can be attributed to the fact that the foreign language was introduced by cultural in-group members and in a quasi teaching scenario.

The last study shifted the focus of investigation to the adult population. Using the memory confusion paradigm (Taylor et al., 1978), we investigated whether adults form category-representations based on shared knowledge (defined along eating habits). Our results show less conclusive evidence about the strength of these representations but

nonetheless suggest that these categories are formed and when contrasted with race, have the power to diminish the significance of that distinction.

Altogether, based on these results, we have proposed that cues implying shared knowledge with another person have an important role in representing social groups or categories. The significance of this comes from the fact that such cues provide direct evidence of whether the other person possesses knowledge that is valid within a social environment and that makes interactions with the other person successful both on an dyadic level (due to its role in communication) and the group level (due to its role in maintaining norms). Our notion of shared knowledge on an interpersonal level resonates with the idea of common ground in communication theories. That is, for communication to be successful, participants of an interaction presuppose a set of background knowledge that will guide what and how is communicated. Crucially, the presupposition also includes the presupposition that the partner will rely on the same expectation (Stalnaker, 2002). Common ground may include knowledge acquired prior to the interaction (shared knowledge) or be shaped during the interaction (Kecskes & Zhang, 2009). On the group level, relying on the assumption of shared knowledge allows people to exploit the advantages of cultural insitutions (e.g. how traffic rules allow us faster transportation [using a car] without constant danger).

We also suggest that one of the most important roles of encoding such features is what it undertakes in social learning: people manifesting knowledge specific to a group are reliable in the sense that they will transmit information that is useful to survive and function as part of a group. Selective learning mechanisms based on this also ensures that the cohesiveness of social groups are maintained over generations and thus, cumulative cultural evolution can happen (Boyd & Richerson, 1996; Richerson & Boyd, 2005). In the next section, I will focus on the two facets of human behavior that are intimately linked with social categorization according to our account: cooperation and social learning. In the second half of the discussion, I will present challenges and open questions (representational format, familiarity, developmental trends).

8.1. Cooperation and categorization

The role of applying categories and labels to fellow humans in making judgments about possible allegiances has always been at the core of the topic of social categorization and in the focus of research from the first wave of investigation in social psychology (see Allport, 1950). This idea is reflected in phenomena such as ethnocentrism, racism, antisemitism and all forms of group-based prejudice. The label attached to an individual determines attitudes toward that person and defines the friendly or antagonistic relationship between two people. With a more positive spin on the question, researchers have argued that we cluster people together based on coalitional allegiances in order to identify people that are likely to cooperate with each other (Kurzban et al., 2001; Cosmides et al., 2003). Thus, social categorization and the question of cooperation have always been intertwined both in common intuition and also from a scientific point of view. The reason for the latter is that the most unique and characteristic feature of human cooperation is that humans engage in such large-scale cooperation in societies that require significantly different capacities than what is necessary for dyadic interactions (e.g. Henrich, 2004). There are at least two challenges that lie in such processes: 1, identifying those from a large pool of individuals that we can trust to be willing to cooperate; 2, cooperating without direct contact with another person and engaging in cooperative behavior that requires the contribution of multiple participants that may not even meet face-to-face. The two challenges are not at the same level and while the first problem may be overcome by other species, the latter seems to require abilities that are specific to humans. For the first challenge, the so-called "tag-based cooperation" may provide a solution, while the latter requires institutionalized social norms. In the next section, I will deal with the two questions separately in relation to experimental data.

8.1.1. Tag-based cooperation

Classical evolutionary explanations for altruistic behavior or cooperation have described mechanisms through which the benefit of cooperative behavior is quite apparent or "direct", such as in the case of reciprocity (Axelrod & Hamilton, 1981; Trivers, 1971) or kin selection (Hamilton, 1964). The cost the cooperator endures is compensated for by the potential reciprocation in the future or by the fact the benefits of the action will be reaped by carriers of the same gene. However, group-level cooperation

has been seen as a challenge for such accounts (e.g. Bowles & Gintis, 2004, but see for example, Burnham & Johnson, 2005 or Lehmann, Keller, West & Roze, 2007 for views that argue for no controversy in relation to large-scale cooperation). The challenge lies in the fact that we often cooperate with those that are not related to us or where we cannot rely on past experience to judge whether we can expect reciprocity. One solution to this problem is tag-based cooperation (Axelrod, Hammond & Grafen, 2004), during which individuals engage in cooperative behavior with another individual based on whether they possess a certain indicator of being a good partner for cooperation (i.e. will not defect, will reciprocate, etc.). These "tags" are certain phenotypical traits that are somehow related to the cooperative potential of the partner. This assortative strategy has been often criticized on the grounds that for humans, it may not be biologically viable to assume a stable relationship between phenotypic traits and genotype related to cooperative potential that is not easily subjected to exploitation by defectors (Gardner & West, 2010). Without such a reliable connection, it is unreasonable to assume any evolutionary adaptation. Nonetheless, Cohen, Atkinson, Dediu, Dingemanse, Kinzler and colleagues (2012) have argued that linguistic cues, such as accent variations may be viable tags for cooperation for the reasons that they are 1, characteristic of a group of people living close enough for fruitful collaboration; 2, readily observable and easy to compare across individuals; 3, hard to fake; 4, inherited in a cost-effective way.

This idea is in line with results in developmental psychology showing that linguistic cues guide social preferences from an early age (e.g. Kinzler et al., 2007; Kinzler et al., 2009; Souza et al., 2013, etc.). Potentially, this openness to cooperate with those similar to us in language use is reflected in young children's selective learning processes from linguistic in-group members (e.g. Buttelmann et al., 2013; Howard et al., 2015; Shutts et al., 2009, etc.).

Importantly, while this view does not necessarily require category representations at the underlying mechanism, tag-based cooperation certainly emphasizes the inductive power of seemingly independent features and resonate well with theories arguing that attention to cooperative potential is strongly linked to drawing distinctions between humans based on a few selected markers (Kurzban et al., 2001). In this view, certain markers are attended to because of their potential to signal the opportunity for cooperation, and due to the fact that direct cues in this respect are often absent, the mind

searches for other markers that are highly correlated with it (e.g. race see Cosmides et al., 2001).

An important feature of accent as a viable tag is that it is a cultural product, yet differs from other cultural markers such as body paint, flags, etc. in that it is more difficult to fake and thus is a better candidate to drive evolutionary processes related to assortative strategies. However, Pietraszewski and Schwartz (2014b) challenge the view that the significance of accent in person perception can be accounted for by such a mechanism. In their study, they show that accent as a dimension of social categorization is independent of detecting coalitional allegiances. Thus, accent gains relevance on a different basis. In our view, this basis is that accent is a reliable marker of culturally shared knowledge in general.

Our own results from studies 3 and 4 may be consolidated with the tag-based cooperation idea; however, this account in itself would not predict similar patterns in selective social learning based on other aspects of shared cultural knowledge (see Study 2). The results of Study 1 showing that different facets of cultural knowledge form a structured set of knowledge also implies more complex mechanisms behind the phenomena. Our view, thus, places the emphasis more on the type of cooperation that is realized with the help of institutionalized social norms.

8.1.2. Institutionalized norms

Another form or cooperation among humans happens through institutionalized norms. One important feature of such norms is that they are generally arbitrary but play a crucial role in maintaining group cohesion and once accepted by group members become of vital importance to success or even survival within a group. Thus, norms like these are group-specific (Boyd & Richerson, 1996). Such norms range from defining what tools we use to eat with, to how we talk to what side of the road we drive on. Such an extended form of cooperation is extremely rare if not non-existant in the animal kingdom and requires very specific cognitive capacities (Moll & Tomasello, 2007). One of the most important of those is the assumption that norms will be kept by others as well, otherwise they become dysfunctional. A huge body of literature addresses the question of how norms are enforced and how the free-rider problem is handled (e.g. Boyd, Gintis, Bowles

& Richerson, 2003; Guzman, Rodriguez-Sickert & Rowthorn, 2007; Boyd, Gintis & Bowles, 2010). Since norm-violations on occasion may provide the individual advantage at the cost of harming the group itself, motivational questions are always at the core of the maintenance of norms. However, there is an arguably more fundamental issue: people may not possess information about norms. For cooperation based on norms to be successful, members have to have a default expectation that knowledge about them is shared. Thus, I would argue that monitoring others' epistemic states and having expectations about shared (cultural) knowledge is the first step in realizing group-level cooperation and precedes that of any motivational factors. To determine how interactions may be conducted with another person, it is vital to assess their knowledge states. Since arbitrary norms are set on a group level, the default assumption should be that people who can be categorized as "in-group" would share knowledge of rules and norms defined by the group (cultural knowledge). Study 1 addressed this question by linking two facets of cultural knowledge. However, importantly, the assumption could not work without mechanisms that ensure that group members indeed possess the necessary knowledge.

8.2. Social learning

Appropriate social learning mechanisms are indispensable in creating, maintaining and developing human cultures (Boyd & Richerson, 1996; Tomasello et al., 1993; Henrich & Boyd, 1998; Gergely & Csibra, 2006). Human cultures present numerous challenges for social learning mechanisms: 1, knowledge should be passed on in a relatively faithful manner even when its function is opaque to the observer. Opacity comes from at least two characteristics of human cultures. First, the appearance of recursive tool-use makes it difficult to gain an understanding of the mechanisms behind instrumental actions (see Natural Pedagogy (Csibra & Gergely, 2006) – even if these mechanisms are defined by the laws of physics and have a logical structure. Second, there are elements of cultural knowledge that are arbitrary – both in tool-use and in other social norms. The theory of Natural Pedagogy extensively discusses how an early-emerging sensitivity helps even infants to select relevant knowledge under the conditions of causal opacity (Csibra & Gergely, 2006; 2009; 2011; Gergely & Csibra, 2006). However, given the second type of opacity, the best strategy children could apply in acquiring information about culture-specific knowledge is to select between informants based on group-

membership. Since the goal is to acquire the knowledge necessary to succeed in a given social environment, children had best pay attention to direct cues to cultural knowledgeability. In the studies presented in the dissertation, we have tried to show that children exhibit such selectivity based on two cues to possessing culture-specific knowledge: language (Study 3 and 4) and tool-use (Study 2). While language has been shown to drive selective learning by other researchers as well (e.g. Buttelmann et al., 2013; Howard et al., 2015); in Study 2, we were able to show that children also give credit to other cues of shared cultural knowledge.

The second challenge lies in how knowledge is generalized. Children from early on have a disposition to take information presented in a communicative setting as generalizable (Csibra & Gergely, 2009; Futó et al., 2010; Yoon et al, 2008). This ensures that we automatically encode the received knowledge as valid for a kind and saves us the trouble of individual learning on every occasion meeting a new exemplar. While the genericity bias described in the Natural Pedagogy theory (Csibra & Gergely, 2009) refers to extracting kind-based knowledge and thus generalizing to other objects, another form of extending information beyond the scope of the learning situation involves the assumption that there are other people in possession of the same knowledge (universality assumption). This is also of vital importance since – as mentioned above – social norms and coordinating behavior (including communication) in general would not be possible without relying on other people having the same knowledge base. We argue that given the structure of human societies and the stratification of knowledge that comes with it, an adaptive mechanism would include an expectation that knowledge is not universal per se, but shared between certain people. Putting these two together, we expected to see - and were able to show in Study 3 – that generalizing knowledge about objects only happens when the demonstrator of the object function was a cultural in-group member. When an out-group presents the object functions, children either treat it as a unique action that should not provide any information about the object kind (or even the usage of the very same object in a subsequent context or episode) or expect the function information to be generalizable to a kind but only in the social environment of the out-group member Thus, in the first case, no genericity bias is evoked at all, while the second possibility assumes a more sophisticated processing whereby children expect the object function to refer to a kind but they do not generalize this knowledge across social groups. Note that we cannot be certain which form of generalization is inhibited in this case. Future studies will have

to address the question of how children represent knowledge attributed to out-group members.

The role of information transfer in social categorization has been supported by studies beyond the ones on imitation. Study1 is one is an example to show that knowledge states are important in forming representations about fellow humans. Marno and colleagues (2016) have shown that selective learning from native speakers may already originate from infants selective willingness to attend to information when their attention is guided by the communicative signals of a native speaker. Moreover, Begus, Gliga and Southgate (2016) have shown that preferences for native speakers are associated with an expectation to receive information already at 11 months of age, as indicated by increased theta activity.

8.3. Representational format

Social categorization is a process that helps us make sense of the complex social world that we live in and to organize our social experiences. Categorization – regardless of domain – optimizes the use of mental capacity by making it possible to efficiently store knowledge. Based on certain features, the human mind identifies an individual or exemplar as a member of a given category, which activates the knowledge base associated with the category. Given the fact that one of the most marked features of adult social categorization is its proneness to turn into stereotyping and prejudice, social categorization very saliently manifests the generalization criterion of categorization: given information about the features of one individual people will extend this to other members encoded as a member of the same category. Moreover, based on the identified category of an individual, people will draw inductive inference about other features of them (cf. Smith & Medin, 1981).

The mental processes and representations underlying young children's behavior in studies like the ones presented in the dissertation are more challenging to define than the phenomena observed in adulthood given the lack of introspective report. To what extent can they be viewed as categorization? Many of the studies arguably cannot go further than to claim that children exhibit preferences (Kinzler et al., 2007; Kinzler et al., 2009; Shutts et al., 2011, etc.) or selectively interact with people (Buttelmann et al., 2013;

Howard et al., 2015; Kinzler et al., 2007; Renno & Shutts, 2015, etc.) based on certain traits. Studies that involve judgments about interactions that the child herself is not directly a part of (e.g. third-party punishment [Jordan, McAuliffe & Warneken, 2014], judgments about shared preferences of others [Liberman, Kinzler & Woodward, 2014]) as well as those targeting essentialist reasoning (e.g. Diesendruck & HaLevi, 2006, Rhodes et al., 2012; Kinzler & Dautel, 2012) provide a clearer case for categorization, however, such methods are more suited for older children. Kinzler and Liberman (2017) argue that their study (Liberman et al., 2017) showing that 9-month-old infants expect speakers of the same language to affiliate with each other (interact in a friendly, positive way) and speakers of different languages to disengage from each other provide evidence that early emerging preferences reflect underlying concepts of categories. Similarly, another study of the same research group (Liberman et al., 2016) showing that children generalize food preferences across speakers of the same language arguably supports this idea.

In this dissertation, Studies 2 to 4 are subject to the critique that they do not provide evidence of social categorization, but rather say something about social preferences. Study 1 takes a step further in that respect as our main goal was to test whether one feature could provide a ground for inferences about another. Here, we found that children associated foreign language use with unfamiliar tool-use, suggesting that the two features correspond to a structured set of knowledge about people that are based on similarities and differences in cultural knowledge. These results are in line with those of Liberman, Howard, Vasquez and Woodward (2017) who have shown that language based social preferences are associated with expectations about conventionality in behavior already from 3 years of age, but it is not until the later years (7-11 years) that children also make inferences about moral behavior based on language use. Thus, language allows young children to make inductive inferences in a certain domain, but not in any domain. I suggest that the reason for this is that language and other aspects of conventionality are both cues of shared cultural knowledge, and the detection of the boundaries of shared knowledge is of primary importance in social categorization.

The memory confusion paradigm used in Study 5 is a widely accepted method to explore social categorization as it is based on how information is organized along social categories: category-members are perceived as more similar to each other and information gained about one person easily transfers to other individuals within the

category. Thus, adults did show that cultural knowledge can form the basis of social categorization.

The question remains whether there is continuity between these results and the ones observe with young children, especially with the ones on social learning. The question is particularly challenging as fully-fledged categorization means that we have complex representations of the structure of the social environment and we not only divide the world into in-groups and out-groups, but can comprehend that there are not only – for example – "Hungarians" and "Others", but also, Americans, French, Chinese, etc. Importantly, we can also understand that information about Chinese people not only do not necessarily apply to Hungarians, but neither to Americans or the French. Moreover, the human mind is also able to maintain multiple similar representations (e.g. Christians, Jews, Muslims, Atheists, etc.) Arguably, the function of social categorization is to comprehend such a complex, structured social environment (Sperber & Hirschfeld, 2004). One of the problems with interpreting children's behavior in terms of social categorization is that we have very little evidence of how they treat group distinctions that go beyond "in-groups" and "out-groups". There are studies with older children (from pre-school years) that utilize non-existing, made-up categories (e.g. Rhodes & Chalik, 2013; Rhodes et al., 2012); however, most of the studies use distinctions that differentiate between only two categories.

Study 4 raises the possibility that children can distinguish between more than two linguistic groups as we could manipulate their trust toward out-group members, but only toward a specific out-group – the trust did not extend to a third linguistic group. However, we do not know whether children started treating the Czech speaking model as a full member of their group (i.e. would generalize all pieces of information that they perceive valid about the "in-group") or entertained the same representational structure, but changed the category's judgments on epistemic trustworthiness. The latter case would suggest that children's initial representations are already similar to actual categorization.

8.4. Familiarity

One of the most challenging alternative interpretation framework concerning results about children's social preferences and selective learning based on cues such as

language or tool-use claims that the data can be accounted for based on mere familiarity. Thus, children may not form any category-representations and may not make any inferences based on the cues exhibited by the model, but simply prefer people that are familiar and this, in turn, also drives selection in social learning situations as well. Specifically, in the studies I presented in the dissertation there are two phenomena that may be explained away by familiarity: 1, imitation of persons familiar on a certain dimension (Studies 2-4); 2, associating two distinct traits along the basis of familiarity (Study 1). The argument concerning the first one would simply be that children invest trust in those that seem familiar in some respect based on their general preference toward familiar things (Burnham & Dodd, 1999). Children may not make any specific inferences about knowledgeability but would simply refrain from interacting with those that are "unusual". In Study 1, children associated unusual tool-using habits with foreign language use. The argument here could be that this association is based on familiarity, rather any kind of more complex inference or category-representation.

Importantly, we do not claim that familiarity does not play a role in the processes described above. Regardless of whether we conceive of the phenomena described above as category representations or as other basis for inferences or behavior adjustment, the ultimate judgments being made here concern the question of whether the other person shares some feature with oneself. In fact, it would be difficult to conceive of any of the phenomena or cognitive mechanism described in the literature (e.g. social learning studies, Buttelmann et al., 2013, Howard et al., 2015; or preference studies, Kinzler et al., 2007) without the concept of familiarity.

The argument we would like to make is that the system guiding social interactions based on these features has to be more complex than what concerns pure perceptual familiarity. The reason for this is that given the infinite number of potential features that can form the basis of familiarity, the system must select one or only a few at maximum. Thus, the system must also include a model to perform this selection. There are theoretically two possibilities: 1, the system operates at a low, perceptual level, where the selection criteria could hardly be anything else but salience; 2, the system operates at a conceptual level, where the selection criterion is set by some higher-order processes. If the first theory is correct, then the feature that occupies the most amount of attention will be used to compare to one's own corresponding feature. The problem is that this theory is quite difficult to falsify given the difficulty in comparing salience across characteristics

that are very diverse. For example, how can we tell whether skin color is a more salient feature than language use?

Empirical data suggest that preferences and differential behavior toward out-group members can be exhibited much earlier based on linguistic cues than race (Kinzler & Spelke, 2011; Kinzler at al., 2007; Kinzler et al., 2009, etc.) and that young children do not discriminate based on any arbitrary cue (Plötner, Over, Carpenter & Tomasello, 2015, but see Richter, Over & Dunham, 2016). We argue that the study of Kinzler and Spelke that showed that young children did not discriminate between people based on the skin color even in the absence of competing features presents a contradiction for the salience account. Such results fit better with an account of a model-based selection of features.

In our own studies, there are at least two questions that are far from obvious in how to account for based on pure familiarity. First, it has to be specified what elements of the scene are selected to make familiarity-based judgments or associations. In our studies, we developed a method (see Study 1 and 2) where there are no unfamiliar objects present, nor are any unfamiliar goals set during the instrumental actions. What can be conceived of as familiar is the relationship between the goal and the tool (e.g. brushing hair with a fork). Here, the basis of familiarity could be the contingency of the two elements: how often the given goal appears together with the given means. Thus, familiarity cannot be defined on a strictly low-level perceptual basis.

Moreover, in Study 1, we found an asymmetric pattern of results: we observed an association between unfamiliar language and unfamiliar tool-use but no associations were found where the language presented was familiar to children. The question arises why children did not associate familiar language with familiar tool-use in that case. We propose that this is due to the fact that children may perceive these cues in a hierarchy where language occupies a higher place than tool-use. That is, children may allow for subtle variations among linguistic in-groups, but judge people that do not speak their language to be fundamentally different from them. This, together with a default expectation of hearing their native language prompts a more intensive mental processing in Experiment 1 (foreign language) than Experiment 2 (native language) of Study 1 resulting in more focused eye-movement patterns in the former case. Such a result, however, presents a challenge for an explanation based on perceptual familiarity.

Our results of Study 4 probably deserve special attention regarding the familiarity question as the results seem to fit well with this explanation: short-term familiarity with a novel language resulted in a drastic increase in children's willingness to imitate a foreign-language model. While these results certainly do not contradict the familiarity account, a few questions may be raised: It is noteworthy that the imitation rates in the familiarized foreign language condition were just as high as those in the native condition. It seems far from obvious that familiarity should predict this, especially considering that the level of familiarity was still quite low: children did not come to understand the foreign language and the total length of exposure throughout the week only added up to a few hours in total. A logical prediction of the familiarity account would be that reactions would be more graded: little familiarity evokes a little higher rate of imitation but children would still differentiate between the native speaker and the model who speaks in a somewhat familiar language. That is, of course, if familiarity is evaluated in itself and does not form a part of more complex representations. Our interpretation is thus that children imitate the speaker of the familiarized language because it was introduced by people they already trusted or had come to trust during the week and could be seen as members of their social group. Throughout the familiarization period they learned to endorse that particular language as part of shared knowledge and when they were faced with someone who also possessed knowledge of it, they deemed the information coming from her as reliable. Our ongoing project provides an empirical test of this proposal.

Regarding the role of familiarity in studies like the ones I presented in the dissertation, it has been suggested that a preference for similar others has had a defining role in shaping human cultures. The theory has been dubbed "homophily-based account of human culture" (Haun & Over, 2013). The authors claim that a preference for interacting with similar others can account for the formation of distinct social groups that are individually tied together by a certain set of cultural norms, i.e. that each group creates its own behavioral repertoire and while this tendency is universal, the actual content is diverse across groups or cultures. They also argue that homophily can explain the occurrence of high-fidelity imitation of in-group members in children – which is indispensable for the stabilization of cultures.

8.5. Developmental trends

An important question concerns the developmental trends of the phenomena described in the studies on "social categorization". While the behavior of children in our studies (and also others carried other in a similar theoretical framework or using similar methodologies, e.g. Buttelmann et al., 2013; Howard et al., 2015; Kinzler et al., 2012; etc.) may not reflect real category representations, in accordance with other researchers (e.g. Liberman et al., 2017; Kinzler & Liberman, 2017; Begus et al., 2016) we suggest that the early emerging sensitivity to and preference for certain behavioral traits has a continuity with the social categorization processes of adults. As described above, there is evidence to support the claim that preferences for speakers of the native language originate from conceptually rich categories as these preferences are associated with specific generalizations already in infancy (Liberman et al., 2016; Liberman et al., 2017; Liberman et al., 2017).

Since in this dissertation I have argued that children essentially look for cues of shared cultural knowledge, the question arises of how different cues to shared knowledge gain significance. Study 1 showed that language as a cue may be higher in the hierarchy of cues as children seem to be more tolerant toward the idea that native speakers would use tools in a different way than themselves (see Experiment 2, where children did not differentially associate a native language with conventional tool-use). Since language is a capacity that occupies a prominent role in the cognitive system even beyond the one it serves in social categorization and that therefore develops very early (Vouloumanos & Werker, 2007), children may make use of it in categorization before they do it with other cues, such as tool-use. Although the propensity of the brain to look for matches in knowledge bases may be innate, before any cue can be effectively utilized, the cognitive system has to be able to collect enough information – similarly to how we fill in empty placeholders in the mind. From infancy, language is possibly the most salient cue that we hear every day and as a result of the workings of a special faculty (Chomsky, 1965; Pinker, 1989), we can differentiate between subtle variations in linguistic cues (Nazzi, Bertonzini & Mehler, 1998).

The placeholder for "tool-use" may be filled in later in development. One reason for that is that due to the slower maturation of the motor system, tools become relevant much later than language. Results suggest that children start to treat artifact functions as

fixed around 3 years of age (Casler & Kelemen, 2005), thus tool-use may become a reliable cue to cultural knowledgeability around the same time. In our studies, we tested 3-year-olds with the imitation paradigm that showed that by this age, children robustly prefer to learn from a conventional tool-user. Although we do not have data with the same paradigm with younger children, we would predict to find less clear pattern of results.

A further challenge lies in placing the results with the "minimal group paradigm" in this system. While we have argued that categorization based on a few distinctive markers can be accounted for and can be related to a specific evolutionary function, a very important feature of adult social categorization is that we do it with any possible distinction. Studies on race with young children (e.g. Kinzler & Spelke, 2011) show that race starts to form the basis of social preferences much later than language and even later than on tool-use (compared to our own studies, although methodologies are different in that case). So when do children start to use minimal group distinctions? A study by Plötner, Over et al. (2015) suggests that while 3.5-year-old children's affiliative responses were unaffected by minimal group distinction, 5-year-olds already took it into account. Thus, this suggests that sensitivity to minimal group distinctions emerges around the same age race starts to gain significance for children.

The striking difference between the seemingly rigid system of children and the remarkably flexible system of adults (and children older than 5) calls for explanation. One possibility is that much of the developmental data on preferences and selective learning based on linguistic cues (e.g. Buttelmann et al., 2013; Kinzler et al., 2007 and our own studies) actually correspond to entirely different mental processes than the classic studies in social psychology with adults (e.g. Tajfel et al.,1970; Taylor et al., 1971). That is, the preferences of children are neither based on category representations, nor are precursors for later emerging fully-fledged mental representations of groups or categories. The other possibility that we propagate in line with other researchers (Libermann et al., 2017) is that the two processes are linked and share a developmental trajectory. Although empirical evidence regarding the transition is sparse and any explanation can only be speculative, our suggestion is that the system *is* flexible to begin with. Indeed, our theory proposing that one of the most important functions of social categorization is to map out overlaps between knowledge states implies that the efficient workings of such a system should be flexible. Human societies are a net of both hierarchically organized and intertwined social groupings that are each characterized by a set of shared norms and knowledge. These may

also be called sub-cultures. Social category representations help humans understand that behavioral rules and customs change from group to group and even if these are slight variations, they call for an adjustment of behavior (e.g. I will not necessarily use the word "peer-review" without explanation when I am among my friends outside the university, but I will rely on this piece of shared knowledge when talking to colleagues).

Our suggestion is that reasoning about social groups and categories is part of our core knowledge (Spelke & Kinzler, 2007) and that its adapted function is to map out these variations in shared knowledge. In the first few years, children are only responsive to cues of social categories that they can directly map onto this theoretical distinction. Language and tool-use may be early emerging facets, as described above, but any cue that is relevant for children may play the same role. Importantly, as children gain more and more knowledge about the world, more and more anchors are created that help organize information, resulting in a sophisticated representational space where multiple cues may serve as signals of shared knowledge (e.g. symbols, clothing, etc.). With time, learned correlations between qualities may also foster category formation (e.g. between race and cultural knowledge, see Study 5). Although this is speculative, minimal groupings may become relevant when children seem to master the ability to explicitly reason about social groups, at around 4-5 years of age (based on studies on essentialist reasoning, e.g. Diesendruck & haLevi, 2006; Rhodes et al, 2012). Interestingly, this is the same age when explicit theory of mind can be robustly manifested.

As stated earlier, currently available empirical data is not sufficient to lend strong support for this hypothesis (about the continuity of mental processes and the mechanism behind the emergence of adults' flexible system). However, our results from Study 4 suggest that language based preferences are indeed quite flexible, as otherwise it would be difficult to explain why such short term familiarization resulted in children treating the speaker of a foreign language as equal to members of their own linguistic group. Social learning and social categorization are processes that facilitate each other and their interdependence results in the stabilization of cultures and sub-cultures: children treat the information received from a person of trust (initially the parents, in most cases) as valid and people sharing that knowledge will be treated as reliable from whom further information may be gained. In study 4, children learned that Czech language is part of the established shared knowledge; therefore trust will be extended to those sharing knowledge of that.

Future studies should address the continuity between phenomena traditionally described as "social categorization" that nonetheless show significant variations in their mechanisms.

8.6. Methodological issues

The studies presented in the dissertation have their own methodological challenges and – no doubt – shortcomings. The first one concerns the fact that we worked with monolingual models for whom the other language used in the experiments (Studies 1, 3 and 4) were only their second language. In Study 4, the two foreign languages were both novel to the model as well. In this case, it would have been extremely difficult to find an experimenter who had three native languages. Instead, we asked native speakers of both languages to train our model to say her lines with the best accent possible. While this is clearly not the optimal solution, children did differentiate between the model's use of their native language and the foreign language as shown by the differences in imitation rates (we found differential responses based on language in Study 1 and 3 as well). Since there were no other differences between conditions, we have to attribute it to languages use and conclude that our manipulation was successful. Note also that although a lot of studies target how children respond to people speaking in their native language with a foreign accent (Kinzler et al., 2009; Kinzler et al., 2011; etc.), we do not really know anything about the opposite pattern (foreign language with a native accent).

Another difficulty arising from the applied methods in the imitation studies (broadly defined, Studies 2 to 4) is that while we can conclude with confidence that children do learn from in-group members, it is harder to define what happens in the case of out-group models. Theoretically, there are at least four possibilities among which we cannot conclusively distinguish based on the current data. One possibility is that children do not imitate (or generalize in Study 3) the out-group model because they did not pay equal amount of attention to them. Although gaze directions are not direct measures of attention, we have tried to make sure that there were no major differences in this respect and when children looked away during the demonstration, they were excluded (at least from that trial). Nonetheless, lack of attention would signal that children do not render such significance to the actions of an out-group model, which would be more consistent with our theory than those highlighting that the out-group is threatening (Sherif et al.,

1954). A second possibility is that although children pay attention, they do not encode the information on a long-term and therefore cannot recall what they were supposed to do at test and use emulation instead of imitation. Post-hoc memory-check questions could be used in future studies to test this idea. Third, it is possible that children fully encode the teaching episode but do not trust its content and fourth, they may encode the information as specific to the out-group and therefore do not apply it to themselves. However, they may reproduce the behavior in the company of out-group members. Since in our studies, the experimenter present during testing was always a (linguistic) in-group member, we cannot be sure about how children would have behaved otherwise. This also presents somewhat of a methodological catch-22 as young children have a tendency to remain passive when the experimenter is not a person of trust, producing data that is impossible to interpret. Nonetheless, clever modifications to the paradigms may help clarify this.

Another difficulty with the studies using tool-use as indication of group membership is finding the appropriate props. The main principle behind object selection was to keep every element of the scene equally familiar to children and only vary familiarity in the association between the tools and the goal. We chose the two goals - one tools setting as opposed to the two possible tools – one goal setting because studies on the teleofunctional stance show that children view the function of a tool as fixed (Kelemen, 1999) – or at least within a cultural setting. However, children may be more liberal to accept that the same goal may be realized with different tools (e.g. a comb and a brush may both be used to get rid of the tangles in one's hair, but a comb should not be used for any other purposes). Keeping these in mind, we had to find tools that are equally affordant to bring about two different goals. This poses challenges as the design-stance (Dennett, 1989) is not only manifested in a mental bias but tools are actually optimized for a certain goal during their production. If the tools are not equally affordant for the goals set in the in-group and the out-group condition, it could be argued that the "incompetence" of the model is not only exhibited as unfamiliarity with customs but also as an inability to arrive at their goal. However, in all videos, the model expressed satisfaction after performing the goal-directed action, suggesting that they were successful in arriving at their goal.

8.7. Future directions: social categorization and theory of mind

The idea that social categorization serves the function of mapping the borders of shared knowledge implies that these processes have to be linked to other mechanisms used to reason about the epistemic states of others. Thus, theory of mind and social categorization should be intertwined processes. This idea comes up in discussions about how we tend to dehumanize out-group members (i.e. depriving them of human feelings and thoughts – Haslam, 2006). In this view, mentalizing will be "switched off" for out-group members as they are either viewed as simply not having mental states that would show similarity to those of in-group members or those mental states cannot be comprehended by members of a different group. Dehumanization can be viewed as an adaptive mechanism when social category representatations are supposed to serve the function of identifying competing groups (e.g. Sidanius & Pratto, 1993; Sherif et al., 1954).

However, the supposition that social categorization first and foremost serves epistemic functions yields different predictions. Social categorization and theory of mind both serve to gain information about the mental states of fellow humans. Social categorization may provide a quick access to the stable knowledge background of others, while theory of mind constitutes the dynamic element of the process for mental states that can only be computed within the frame of the given interaction. This theory would predict that mentalizing will be more intense when no information about background knowledge can be accessed – that is, for out-group members.

Although at this point, empiricial evidence is sparse on this question, a few studies suggest that this might be the case. For example, Todd, Hanko, Galinsky and Mussweiler (2011) have shown that humans are better at taking the perspective of an out-group member than that of an in-group member. Lately, Westra (2017) has put forth a theory predicting a similar interaction of mentalizing and social categorization whereby it is suggested that stereotypes help inviduals make attributions about the character traits of another person based on group membership which will in turn help make predictions about the person's beliefs, desires, etc., and consequently about their actions.

8.8. Conclusions

In the dissertation I have argued that one of the key functions of sorting fellow humans into categories or representing groups is that it helps identify whether another person shares cultural knowledge with oneself and consequently, especially for children, whether one can bestow epistemic trust upon them and learn from them. Relatedly, I have also argued that if evolutionary forces have driven the cognitive faculty responsible for social categorization in this manner, then cues that are indicative of shared knowledge should trigger this process. The role of language in children's selective learning (Study 3 and 4) supports the idea that knowledge transfer is at the core of the phenomena, not simply because we could find evidence of social learning being guided by – supposedly – categorization (among other researchers, e.g. Buttelmann et al., 2013), but also because linguistic cues fit perfectly the characteristics of a signal that is correlated with cultural variations. Our results showing that other cues indicating shared knowledge (tool-use) evoke similar behavior or representations further suggest that linguistic cues are part of a larger pool of signals that correspond to shared knowledge (Study 1 and 2). Thus, our general conclusion is that perceived correspondence between knowledge bases is an important factor in person perception and possibly categorization.

Importantly, however, it has to be acknowledged that at present, we do not have enough evidence to postulate whether the mental processes related to the behavior of our participants in these studies fit the criteria of "categorization". Moreover, I would like to emphasize that while I propagate the idea that person perception based on shared knowledge explains an important and pervasive facet of phenomena, it is not a unifying account of what is generally considered "social categorization". First of all, category representations do not always map onto actual "groups" – that is, a circle of people that are involved in any kind of interactions with others. Categories, such as sex, age or even "blonds", etc. need not be viewed as ones corresponding to any conglomerate of people who engage in some joint activity at any time. Thus, these have to operate in a different way than how we interpret the findings from the studies in the dissertation.

The category of race may be seen as an interesting result of the interaction of different mental processes related to category representations. In itself, race should not necessarily define groups, however, perceived correlations with shared knowledge or collaboration habits via experience may contaminate these representations. This is

supported by our results from Study 5 and also by the results of Kurzban et al. (2001) that show that race loses its power as a basis for categorization when direct evidence is presented about cultural knowledge or coalitional allegiances. Nonetheless, a rudimentary categorization based on race may exist without attaching any expectations about knowledge or behavior to it (see for example results indicating that 3-month-olds discriminate between faces of different races, Kelly et al., 2005). Moreover, the faculty responsible for detecting kinship categories is also likely distinct from any of the ones mentioned earlier both in function and in operation (Lieberman et al., 2008). It is also possible that shared knowledge is not the only basis for representing groups in general. Rhodes and Chalik (2013), for example proposed that social categories mark interpersonal obligations, category boundaries define how people will relate to each other (whether it is expected that people will protect or harm each other). An alternative, but not completely unrelated, view claims that detecting coalitional allegiances drives categorization (Kurzban et al, 2001, Cosmides et al. 2003). An account we would propose is that these two are actually interrelated: the function of monitoring whether we share knowledge with another individual is that it will give us information about the range of interactions we can conduct with them, including whether the person is a reliable source of information and whether there is even the possibility of cooperation with the person (besides their willingness). Diverse knowledge bases would make it extremely difficult to communicate and thus to cooperate.

In conclusion, while all of the phenomena described above are usually somehow fitted into the concept of "categorization", the functions and underlying mechanism are probably very diverse. The argument we would like to defend is that sorting people into groups and social learning interweave in that humans have an early emerging sensitivity to similarities in epistemic states and a tendency to trust those that possess shared knowledge. We also suggest that it is supposedly a consequence of an evolutionary adaptation that makes it possible to stabilize social groups and make cultural evolution possible.

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11. APPENDICES

Appendix 1. Description of the tool-using actions depicted in the familiarization videos in Study 1.

1. Food vs. Hair: The setup includes a fork and a brush (tools), a plate of food and the model's hair being messy (implication of goals). In the Conventional condition the model uses the fork to eat some potato from a plate, while in the Non-conventional condition the model uses the fork to brush his hair.

2. Liquid vs. Locket: The setup includes a key and a spoon (tools), a glass of liquid and a locket (implications of goals). In the Conventional condition the model uses the key to open the locket, while in the Non-conventional condition the model uses the key to stir the liquid.

3. Banana vs. Paper: The setup includes a knife and a pair of scissors (tools), a banana and some crepe paper (implications of goals). In the Conventional condition the model uses the scissors to cut the paper, while in the Non-conventional condition the model uses them to cut a banana.

Appendix 2. Links of the videos and songs used for familiarization in Study 4.

In Hungarian:

https://www.youtube.com/watch?v=yB7pO4nm338

https://www.youtube.com/watch?v=iz-o5Kp_6-8

https://www.youtube.com/watch?v=TjwxgL4AoLY

https://www.youtube.com/watch?v=uHDwEf3xVnk

In Czech:

https://www.youtube.com/watch?v=z6VGOa1YR0U

https://www.youtube.com/watch?v=iyRpkUF3UyU

https://www.youtube.com/watch?v=O9j6aLWVynE

https://www.youtube.com/watch?v=NlFvue_Hzx0

Appendix 3. Sentences used in Study 5.

INGROUP:

1. Karácsonykor töltött káposzta és mákos bejgli a menü nálunk.
2. Ha vacsorára hívom a barátaim, gyakran pálinkával üdvözlöm őket.
3. A húsvéti menü legfontosabb részei a torma és a sonka.
4. A nyári strandolás elengedhetetlen része a lángos.
5. Újév napján lencselevest eszünk.
6. A hazai ízvilágra jellemző a pirospaprika íze.
7. Egyik hagyományos ételünk a paprikás csirke.
8. Sokféle hazai természetes ásványvíz közül válogathatunk.
9. Egyik finom desszertünk a madártej.
10. Kedvelt hazai köretünk a nokedli.
11. Országunk hires Tokaji boráról.
12. Márton napján libahúst eszünk.

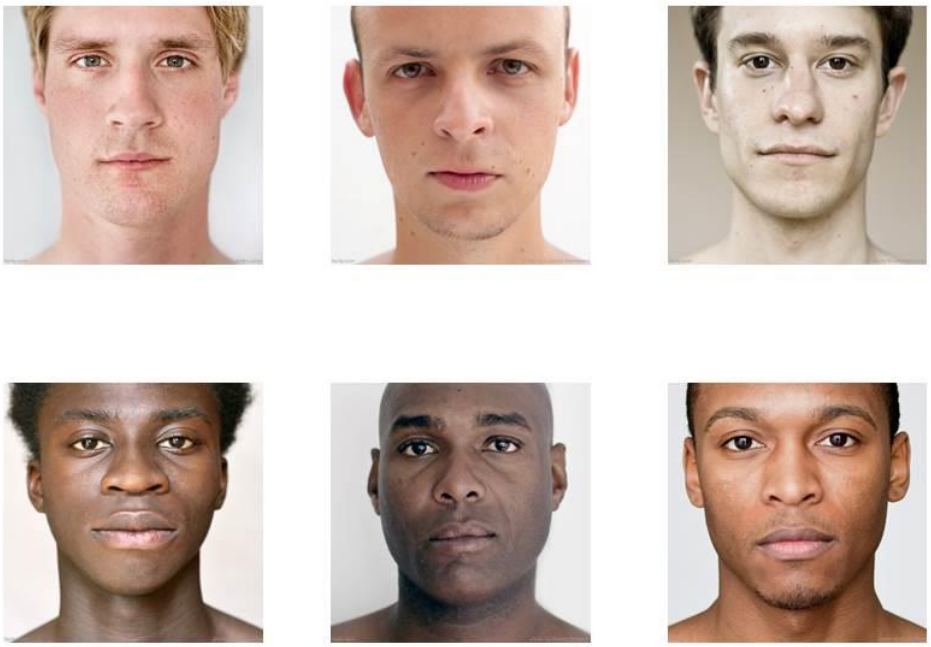
OUTGROUP:

1. Húsfajtáink között megtalálható a strucc.
2. Nálunk csak az asztal bal oldalán illik helyet foglalni.
3. Csak a jobb kezem három középső ujját használom étkezéskor.
4. Amikor étkezünk, nálunk a vendég szed utoljára az ételből.
5. Nálunk sohasem szoktak jó étvágyat kívánni étkezés előtt.
6. Bal kézzel sosem érintem meg az ételt, mert azt nem illik.
7. Miután kiszedtük az ételt a tányérra, legalább 2 percig nem illik hozzálátni az evéshez.
8. A pirított sáska az egyik kedvenc fogásom.
9. A levest nálunk szürcsölve illik enni.
10. Egyik kedvelt desszertünk a lovo.
11. Nálunk nem szabad a másik szemébe nézni evés közben.
12. Ha vendégek jönnek vacsorára, a férj és a feleség nem ülhet egymás mellé.

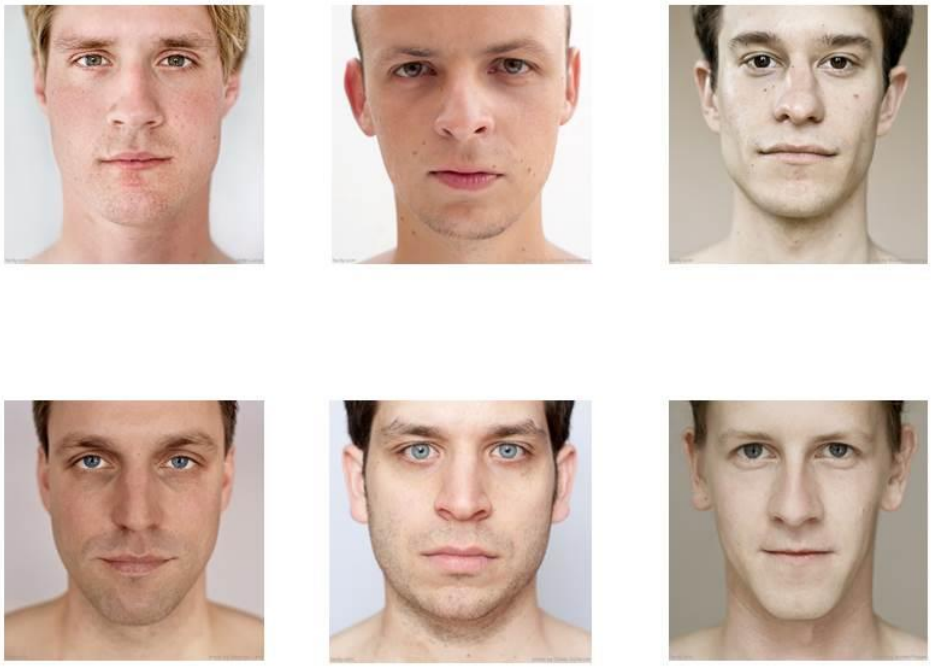
TEST

1. Gyakran nincs időm ételt készíteni magamnak.
2. Mindig tartok otthon gyümölcsöt.
3. Fontosnak tartom az egészséges táplálkozást.
4. Gyakran meghívjuk a barátainkat vacsorára.
5. A barátaim közül kevesen tudnak jól főzni.
6. Az étel jobban esik, ha másokkal lehet elfogyasztani.
7. Szívesen megkóstolok bármilyen ételt.
8. A barátaim szerint túl lassan eszem.
9. Étkezés után mindig elálmosodom.
10. Érdemes naponta legalább három étkezést beiktatni.
11. A víz a legjobb szomjoltó.
12. A tésztaételek meglehetősen laktatóak.
13. Sokan nem kívánják reggel a nehéz ételeket.
14. Az éjszakai étkezés nem egészséges.
15. Olcsóbb otthon főzni, mint vendéglőbe járni.
16. A káposztában kevés a kalória.
17. Sokak szerint a nyers étel egészségesebb, mint a főtt.
18. Mindenkinek több zöldséget kellene fogyasztania.

Appendix 4. Faces used for the male version of the race vs shared knowledge memory confusion paradigm in Study 5.



Appendix 5. Faces used for the male version of the shared knowledge baseline version of the memory confusion paradigm in Study 5.



[6]ADATLAP

a doktori értekezés nyilvánosságra hozatalához

I. A doktori értekezés adatai

A szerző neve: **Oláh Katalin**

MTMT-azonosító: **10033081**

A doktori értekezés címe és alcíme: **The role of shared cultural knowledge in young children's social categorization processes**

DOI-azonosító[7]: **10.15476/ELTE.2017.204**

A doktori iskola neve: **Pszichológiai Doktori Iskola**

A doktori iskolán belüli doktori program neve: **Kognitív Pszichológia Program**

A témavezető neve és tudományos fokozata: **Király Ildikó, PhD és Topál József, DSc**

A témavezető munkahelye: **Király Ildikó: ELTE PPK, Topál József: MTA TTK.**

II. Nyilatkozatok

1. A doktori értekezés szerzőjeként[8]

a) hozzájárulok, hogy a doktori fokozat megszerzését követően a doktori értekezésem és a tézisek nyilvánosságra kerüljenek az ELTE Digitális Intézményi Tudástárban. Felhatalmazom a Pszichológiai Doktori Iskola hivatalának ügyintézőjét, Barna Ildikót, hogy az értekezést és a téziseket feltöltse az ELTE Digitális Intézményi Tudástárba, és ennek során kitöltse a feltöltéshez szükséges nyilatkozatokat.

b) kérem, hogy a mellékelt kérelemben részletezett szabadalmi, illetőleg oltalmi bejelentés közzétételéig a doktori értekezést ne bocsássák nyilvánosságra az Egyetemi Könyvtárban és az ELTE Digitális Intézményi Tudástárban;[9]

c) kérem, hogy a nemzetbiztonsági okból minősített adatot tartalmazó doktori értekezést a minősítés (dátum)-ig tartó időtartama alatt ne bocsássák nyilvánosságra az Egyetemi Könyvtárban és az ELTE Digitális Intézményi Tudástárban;[10]

d) kérem, hogy a mű kiadására vonatkozó mellékelt kiadó szerződésre tekintettel a doktori értekezést a könyv megjelenéséig ne bocsássák nyilvánosságra az Egyetemi Könyvtárban, és az ELTE Digitális Intézményi Tudástárban csak a könyv bibliográfiai adatait tegyék közzé. Ha a könyv a fokozatszerzést követőn egy évig nem jelenik meg, hozzájárulok, hogy a doktori értekezésem és a tézisek nyilvánosságra kerüljenek az Egyetemi Könyvtárban és az ELTE Digitális Intézményi Tudástárban.[11]

2. A doktori értekezés szerzőjeként kijelentem, hogy

a) az ELTE Digitális Intézményi Tudástárba feltöltendő doktori értekezés és a tézisek saját eredeti, önálló szellemi munkám és legjobb tudomásom szerint nem sértem vele senki szerzői jogait;

b) a doktori értekezés és a tézisek nyomtatott változatai és az elektronikus adathordozón benyújtott tartalmak (szöveg és ábrák) mindenben megegyeznek.

[6] Beiktatta az Egyetemi Doktori Szabályzat módosításáról szóló CXXXIX/2014. (VI. 30.) Szen. sz. határozat. Hatályos: 2014. VII.1. napjától.

[7] A kari hivatal ügyintézője tölti ki.

[8] A megfelelő szöveg aláhúzandó.

[9] A doktori értekezés benyújtásával egyidejűleg be kell adni a tudományági doktori tanácshoz a szabadalmi, illetőleg oltalmi bejelentést tanúsító okiratot és a nyilvánosságra hozatal elhalasztása iránti kérelmet.

[10] A doktori értekezés benyújtásával egyidejűleg be kell nyújtani a minősített adatra vonatkozó közokiratot.

[11] A doktori értekezés benyújtásával egyidejűleg be kell nyújtani a mű kiadásáról szóló kiadói szerződést.

3. A doktori értekezés szerzőjeként hozzájárulok a doktori értekezés és a tézisek szövegének plágiumkereső adatbázisba helyezéséhez és plágiumellenőrző vizsgálatok lefuttatásához.

Kelt:

a doktori értekezés szerzőjének aláírása